Sauget Area 2 Superfund Site

Operable Unit 1

Sauget and Cahokia, St. Clair County, Illinois

Record of Decision

U.S. Environmental Protection Agency Region 5

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Chicago, IL 60604

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Part 1 – Declaration

1.1 – Site Name and Location

Sauget Area 2 Site
Operable Unit 1 (soil, sediments, surface water and groundwater contamination source areas)
CERCLIS ID# ILD000605790
Sauget and Cahokia, St. Clair County, Illinois

1.2 – Statement of Basis and Purpose

This decision document presents the remedy chosen by the U.S. Environmental Protection Agency (EPA) ("Selected Remedy") for Operable Unit 1 (OU1) at the Sauget Area 2 Site in Sauget and Cahokia, St. Clair County, Illinois. EPA chose the Selected Remedy for OU1 in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Contingency Plan (NCP). This Record of Decision (ROD) for the Selected Remedy includes the documents considered and listed in the Administrative Record Index at Appendix A.

The State of Illinois has indicated that they concur with the Selected Remedy. The State's letter supporting the Selected Remedy will be added to Appendix G upon receipt.

1.3 - Assessment of Site

The Selected Remedy is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 - Description of Selected Remedy

As set forth in Section 2.2 below, EPA and Site potentially responsible parties (PRPs) have already implemented extensive clean-up activities in Sauget Area 2. These actions have addressed some of the more toxic and mobile contaminant source materials formerly present at the Site. A "source material" is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration for contamination to groundwater, surface water, or air; or acts as a source for direct exposure.

The Selected Remedy, referred to as remedial action for OU1, will address remaining contaminant source materials at the Site and will be the first of two remedial decisions for remedial action for the Sauget Area 2 Site. EPA's overall strategy for cleaning up the Site is to first address soil, sediments, surface water, and groundwater contamination source areas through this remedial action for OU1, which will be the final remedy for contaminated soil, sediments, surface water, and groundwater contamination source areas at the Site. Area-wide groundwater contamination resulting from contamination present in the Sauget Area 1 and 2 Sites will be

addressed in a separate, subsequent remedial action after the soil, sediment, surface water and source area remedies are implemented in the Sauget Area 1 and 2 Sites. The regional groundwater remedy will be selected in a separate groundwater ROD for the Sauget Area 1 and Sauget Area 2 Superfund Sites.

The remedial action proposed in this ROD will be the final remedy for contaminated soils, sediments, surface water, and groundwater contamination source areas at the Sauget Area 2 Site. As described further in Section 2.1 below, Sauget Area 2 consists of five inactive disposal areas (Sites O, P, Q, R, and S). Of these disposal sites, three are closed landfills (Sites P, Q, and R), one consists of four closed sludge lagoons (Site O), and one is a waste disposal site (Site S) associated with an abandoned solvent reclamation facility. Figure 1 shows the location of the Sauget Area 2 Sites. The Selected Remedy for OU1 at the Sauget Area 2 Site, in addition to the continued operation of the existing groundwater barrier wall and extraction system (described below), consists of the following alternatives:

- Selected Alternative for Site O and O North: Alternative O2: 35 IAC § 724 Compliant[1] Soil Cap Over Identified Waste Areas and Institutional and Access Controls;
- Selected Alternative for Site P: Alternative P3: Collection, Treatment, and Off-Site Disposal of NAPL at Well (LEACH P-1), Asphalt Cap over Potentially Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Selected Alternative for Site Q North: Alternative QN2: 35 IAC § 724 Compliant Crushed Rock Cap Over Dogleg Area, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Selected Alternative for Site Q Central: Alternative QC3: In-Situ Soil Vapor Extraction (SVE) at Potentially Mobile Source Area (AT-Q32), 35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls;
- Selected Alternative for Site Q South and Q South Ponds: Alternative QS3: Removal of Intact Drums at AT-Q35, 35 IAC § 724 Compliant Cap Over Identified Waste Areas, and Institutional and Access Controls;
- Selected Alternative for Site R: Alternative R2: 35 IAC § 724 Compliant Soil Cap Over Entire Site and Institutional and Access Controls; and
- Selected Alternative for Site S: Alternative S3: In-Situ SVE of Potentially Mobile Source Area, 35 IAC § 724 Compliant Soil Cap Over Entire Site, and Institutional and Access Controls.

[1] A 35 IAC § 724 compliant soil or crushed rock cap meets the performance standards of a RCRA subtitle C cap, except the component requiring long-term minimization of migration of liquids. This component is not appropriate for the Sauget Area 2 Sites due to Site-specific conditions (see Section 2.10.2).

This Selected Remedy for OU1 at the Sauget Area 2 Site addresses principal threat wastes that are present at the Site. A "principal threat" waste is a source material that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. Previous removal actions conducted by EPA at Site Q Central and Site Q South already have removed principal threat wastes by excavating and disposing off-Site approximately 3,271 drums and 14,000 tons of high-level polychlorinated biphenyl (PCB) contaminated soil. EPA also ordered the construction of a groundwater barrier wall, called a Groundwater Migration and Control System (GMCS), next to the Mississippi River as an early interim OU2 groundwater remedy to capture and treat area groundwater before it releases to the River.[2] However, additional principal threat wastes have been observed at Site P, Q North, Q South, and R, and the GCMS and the remedies selected in this ROD target these areas. Specifically, Alternative P3 addresses principal threat wastes on Site P by treating the recovered NAPL located there through removal and off-Site incineration. Alternative QS3 addresses principal threat wastes at Site Q South through removal and off-Site treatment and disposal of intact drums located there. The principal threat wastes identified on Site Q North and Site R, as well as the NAPL located at these two sites, is captured by the Sauget Area 2 GMCS and treated by the Village of Sauget American Bottoms Regional Water Treatment Facility (ABRTF).

To address the remaining low-level threat waste, engineering controls[3] in the form of engineered covers will be installed to prevent the direct contact exposure pathway[4]. Engineered covers meeting the requirements of 35 IAC § 724[5] will be installed over Sites O, O North, Q North, Q Central, Q South, R, and S; and a 35 IAC § 807[6] cap will be installed over Site P. Additionally, contaminants will be treated in-situ with SVE at Site Q Central and Site S.

1.5 - Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is

[2] In September 2002, EPA issued a CERLCA Section 106 unilateral administrative order (UAO) requiring potentially responsible parties (PRPs) to install the Sauget Area 2 GMCS as an interim OU2 groundwater remedy for the Sauget Area 2 Site. This system is comprised of a 3,300 ft long "U"-shaped, fully penetrating barrier wall located downgradient of Site R, Sauget Area 2, the former Clayton Chemical facility, Solutia's Krummrich plant as well as other facilities, and Sauget Area 1. The barrier wall extends from approximately 3 feet below ground surface down to the top of bedrock and includes three groundwater extraction wells on the upgradient side of the wall. The GMCS intercepts and captures an estimated 210 million gallons of contaminated groundwater a year, which is pumped to the American Bottoms Regional Water Treatment Facility (ABRTF) in Sauget. The groundwater is treated at the ABRTF and ultimately discharged to the Mississippi River in compliance with the terms and conditions of the ABRTF's National Discharge Pollutant Discharge Elimination System (NPDES) permit issued under the Clean Water Act.

[3] Engineering controls encompass a variety of engineered and constructed physical barriers (e.g., soil capping, sub-surface venting systems, mitigation barriers, fences) to contain and/or prevent exposure to contamination on a property.

[4] An exposure pathway refers to the way in which a person may come into contact with a hazardous substance, whether it is a chemical, biological, or some other harmful substance. There are three basic exposure pathways: inhalation, ingestion, or direct contact.

[5] State of Illinois Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

[6] State of Illinois Standards for Solid Waste.

cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

This remedy satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). The Selected Remedy calls for the treatment of NAPL through off-Site incineration of the collected NAPL from Site P, the removal and off-Site treatment and disposal of intact drums from Site Q South, and the treatment of contaminants in-situ with SVE at Site Q Central and Site S. Additionally, NAPL identified on Site Q North and Site R will continue to be captured by the GMCS and treated by the American Bottoms Regional Water Treatment Facility (ABRTF) in Sauget, Illinois. By utilizing treatment in this manner as part of the remedy for the Site, the Selected Remedy satisfies the statutory preference for remedies to employ treatment as a principal element.

However, because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that would allow for unlimited use and unrestricted exposure, EPA will conduct a statutory review within five years after initiation of the remedial action and every five years subsequent, to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 – Data Certification Checklist

The following information is included in the *Decision Summary* section of this ROD. Additional information can be found in the Administrative Record for this Site.

Information Item	Location in ROD
Contaminants of concern and their respective concentrations	Section 2.7.2
Baseline risk represented by the contaminants of concern	Section 2.7
Clean-up levels established for contaminants of concern and the basis for these levels	Section 2.8
How source materials that constitute principal threats will be addressed	Sections 2.11 and 2.13
Current and reasonably anticipated future land use assumptions in the baseline risk assessment and the ROD	Section 2.7.1
Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over	Section 2.9 and Appendix C

which the remedy cost estimates are projected	
Key factor(s) that led to the selection of the remedy	Sections 2.10 and 2.12

1.7 - Authorizing Signatures

EPA, as the lead agency for the Sauget Area 2 Superfund Site (ILD000605790), formally authorizes this Record of Decision.

Richard C. Karl, Director
Superfund Division
EPA Region 5

12-16-13
Date

The State of Illinois Environmental Protection Agency (Illinois EPA), as the support agency for the Sauget Area 2 Site, has indicated that they will concur with this ROD. The State's concurrence letter will be added to Appendix G upon receipt.

Part 2 – Decision Summary

2.1 - Site Name, Location, and Brief Description

The Sauget Area 2 Site is located in the Villages of Sauget and Cahokia, in St. Clair County, Illinois, just east of the Mississippi River, and consists of five inactive disposal areas (Sites O, P, Q, R, and S) described in Table 1 below. Of these disposal sites, three are closed landfills (Sites P, Q, and R), one consists of four closed sludge lagoons (Site O), and one is a waste disposal site (Site S) associated with an abandoned solvent reclamation facility. Figure 1 shows the location of the Sauget Area 2 Sites.

For organizational purposes, EPA has divided the Sauget Area 2 Site into two separate areas, each of which is called an "operable unit" or "OU." OU1 consists of the soil, sediment, surface water and groundwater contamination source areas at the Sauget Area 2 Site. OU2 is the contaminated groundwater itself. EPA will address groundwater contamination in the Sauget Area after remedies are implemented for the soil, sediments, surface water, and groundwater contamination source areas at the Sauget Area 1 and 2 Sites.

EPA is the lead agency for the Sauget Area 2 Site. Illinois EPA serves as the support agency. PRPs investigated the Site, with EPA oversight, pursuant to the remedial investigation/feasibility study (RI/FS) required under a Superfund Administrative Order on Consent (AOC) signed on November 20, 2000. EPA intends to pursue responsible parties to fund or implement the remedy for OU1 set forth in this ROD. That action would be set forth in a remedial design/remedial action (RD/RA) order or settlement for OU1.

Table 1: Descriptions of Sauget Area 2 Disposal Areas

Site Name	Size (acres)	City	Location
Site O, O North, O South	28	Sauget, Illinois	Located on Mobile Avenue, northeast of the American Bottoms Regional Wastewater Treatment Facility (ABRTF) and east of the flood control levee.
Site P	32	East St. Louis and Sauget, Illinois	Bounded by Illinois Central Gulf Railroad tracks, the Terminal Railroad Association tracks and Monsanto Avenue.
Site Q – North	52	Sauget and Cahokia, Illinois	The northern portion of Site Q is bordered on the north by Site R and Monsanto Avenue; on the south by the main track of the Alton and Southern Railroad; on the east by the flood control levee; and on the west by the Mississippi River. The northern portion of Site Q that wraps around the eastern boundary of Site R is known as the "Dogleg" portion of Site Q North.

Site Q – Central	67	Sauget and Cahokia, Illinois	The central portion of Site Q is bordered on the north by Q north; on the south by the Alton and Southern Railroad; on the east by the flood control levee and the Illinois Central Gulf Railroad; and on the west by the Mississippi River.
Site Q – South	87	Sauget and Cahokia, Illinois	The southern portion of Site Q is bordered on the north by the Alton and Southern Railroad; on the south by Cargill Road; on the east by the flood control levee and the Illinois Central Gulf Railroad; and on the west by a 10-foot wide easement owned by Union Electric for transmission lines and a spur track of the Alton and Southern Railroad.
Site R	36	Sauget, Illinois	Site R is bounded on the north by Monsanto Avenue; on the east by the dogleg portion of Site Q; on the south by the main portion of Site Q; and on the west by the Mississippi River. The address for the site is 5 Riverview Avenue.
Site S	<1	Sauget, Illinois	Site S is less than one acre in size and is located southwest of Site O.

Heavy industry has been present on the east bank of the Mississippi River between Cahokia and Alton, Illinois, for nearly a century. Industrial activity in the area peaked in the 1960s. Although many industrial facilities have closed down throughout the American Bottoms floodplain, Sauget Area 2 and the surrounding area is still highly industrialized. Currently, the area is used for industry, warehousing, bulk storage, wastewater treatment, hazardous waste treatment, waste recycling, and truck terminals. In addition to heavy industry, the area also has commercial facilities, bars, nightclubs, convenience stores, and restaurants. A number of petroleum, petroleum product, and natural gas pipelines are located in the area.

No residential land use is located immediately adjacent to or downgradient of Sites O, P, Q, R, or S. Residential areas of Sauget and East St. Louis are separated from the Sauget Area 2 Site by other industries or by undeveloped tracts of land. Limited residential areas exist approximately 3,000 feet to the northeast and southeast of the Site's boundaries. According to the 2010 census, the population of the Village of Sauget, which is where the majority of the Sauget Area 2 Site is located, is 159; the Village of Cahokia is 15,241; and East St. Louis is 27,006.

In the past, groundwater from the American Bottoms aquifer was a major source of water for the area and was used for industrial, non-potable public, and irrigation purposes. Groundwater levels prior to industrial and urban development were near land surface. Intensive industrial withdrawal, along with the use and construction of a system of drainage ditches, levees, and canals to protect developed areas, lowered the groundwater elevation for many years. By the mid-1980s; however, the groundwater levels had increased due to reduced pumping, high river

stages, and high precipitation. Currently, no groundwater is being pumped from the American Bottoms aquifer in the vicinity of Sauget Area 2 for public, private, or industrial supply purposes.

Groundwater is not a source of drinking water in the area. The Village of Sauget and the City of East St. Louis have issued ordinances prohibiting the use of groundwater as a potable water source. These ordinances were issued in response to historic industrial land use in the region and resulting groundwater quality impairments. The Village of Cahokia has an ordinance that restricts groundwater use in part of the municipality, but it does not cover the portion of the Sauget Area 2 Site that is located in Cahokia. Groundwater use restrictions will likely remain in place for the foreseeable future due to the extent of the groundwater quality impairments.

The source of drinking water for area residents is an intake in the Mississippi River. This intake is located at River Mile 181, approximately three miles north and upgradient of the Sauget Area 2 Site. The drinking water intake is owned and operated by the Illinois American Water Company (IAWC) of East St. Louis, and it serves the majority of residences in the area. IAWC supplies water to Sauget and also to portions of Cahokia and Centerville Township. Public water supply is the exclusive potable water source in the vicinity of the Sauget Area 2 Site.

The nearest downstream surface-water intake on the Illinois side of the Mississippi River is located at River Mile 110, approximately 68 miles south of Sauget Area 2. This intake supplies drinking water to residents in the Town of Chester and surrounding areas in Randolph County, Illinois. The nearest downstream public water supply on the Missouri side of the river is located at River Mile 149, approximately 29 miles south of Sauget Area 2. At this location, the Village of Crystal City, Missouri, utilizes a Ranney[7] well adjacent to the Mississippi River as a source for drinking water.

The Mississippi River is the major surface water body draining the area. The stretch of the River adjacent to Site R is bounded by steep embankments lined with rip-rap. A few scattered structures in the River, such as a wing dam and a sunken barge, offer some access points for aquatic birds and mammals and potential protection for fish. In the vicinity of the Site, no bordering wetlands, appreciable bordering vegetation, or submerged or emergent vegetation are present. Recreational and commercial fishing does occur in the Mississippi River; however, no fishing access is available along the Site border. The Sauget Area 2 Site property is used as habitat by at least six threatened and endangered species, including the federally threatened bald eagle and state endangered snowy egret and little blue heron.

2.2 - Site History and Enforcement Activities

A brief description of the disposal, contaminant, and enforcement history for each site is discussed below. A number of initial response actions have been taken at three of the five sites (Sites O, Q, and R) that comprise the Sauget Area 2 Site. No action has been taken at Site P or Site S.

[7] A Ranney well collection system is a patented type of radial well used to extract water from an aquifer with direct connection to a surface water source like a river or lake.

Site O - In 1952, the Village of Sauget began operating a wastewater treatment plant in the area now referred to as Site O. In addition to providing treatment for the Village of Sauget, the plant treated effluent from a number of Sauget industries. In 1965, the four lagoons which comprise Site O were constructed at the Site. Between approximately 1966 and 1978, the lagoons were used to dispose of clarifier sludge from the Village of Sauget wastewater treatment plant (WWTP). The lagoons were initially identified as Site O during an investigation conducted by Illinois EPA in the 1980s (URS, 2002a). The area known as Site O North was identified during review of aerial photographs and was subsequently determined to be the location of pits associated with operation of the Village of Sauget WWTP. Based on the aerial photographs, Site O South appeared to be associated with a breach in the dike of the sludge lagoons.

In 1980, the Village of Sauget closed the four lagoons that comprise Site O by stabilizing the sludge with lime and covering it with approximately two feet of soil. The construction of the cover was not overseen or approved by either EPA or Illinois EPA. Currently, the former lagoons are vegetated with grass, brush, bushes, and trees.

Site P - Disposal Site P was operated by Sauget and Company from 1973 to approximately 1984. It was an Illinois EPA-permitted landfill and was used for municipal and industrial waste disposal. Some of the general industrial wastes accepted at Site P included diatomaceous-earth filter cake from the Edwin Cooper Company and non-chemical waste from Monsanto. Site P is currently inactive and for the most part covered, and access to the site is unrestricted. A nightclub and asphalt parking lot occupy three acres in the southeast corner of the Site.

Site Q - Between the 1950s and the 1970s, Site Q operated as a landfill that accepted municipal waste, septic tank pumpings, drums, organic and inorganic wastes, solvents, pesticides, paint sludge, plant trash, waste from industrial facilities, and demolition debris. Disposal at Site Q occurred both on the surface and subsurface. Due to its large size and varied disposal history, Site Q was divided into sections based on the nature and extent of contamination. Site Q sub-areas are described as follows and presented in Figure 1:

- Site Q North - The northern portion of Site Q. Additionally, the "Dogleg" area is part of Site Q North, which is the northern portion of Site Q North due east of Site R, bounded on the north and south by extensions of the Site R north and south boundaries.

- Site Q Central- The central portion of Site Q.

- Site Q South- The portion of Site Q South of the Alton & Southern Railroad. Additionally, the Q South Ponds are part of Site Q South.

In 1993, Site Q was flooded and River currents unearthed a number of barrels containing hazardous waste. EPA conducted a removal action along the shore of the Mississippi River at Site Q Central; removing polychlorinated biphenyls (PCB) contaminated soils and drums exposed by erosion during the flood. On October 18, 1999, EPA initiated a second removal action at Site Q South. EPA excavated Site waste from eight different areas on 25-acres of Site Q South. Approximately 17,032 tons of waste, comprised of about 20 percent low-level waste (soil concentrations less than 50 parts per million (ppm) of PCBs) and 80 percent high-level waste (soil concentrations greater than 50 ppm of PCBs) were shipped off-Site for disposal. In

addition, 3,271 drums were removed and disposed off-Site. This second removal action was completed on April 5, 2000.

Currently, usage at Site Q includes a roadway, Pitzman Avenue, and a supply terminal along part of Site Q North; a barge terminal facility and five ethanol storage tanks are located along Site Q North and Q Central; and predominantly vacant open land at Site Q South. Access to parts of Site Q North, Site Q North Dogleg, and Q Central are restricted by fences; and access to Site Q South is unrestricted.

Site R - Industrial Salvage and Disposal Inc. operated the River's Edge Landfill, now called Site R, for Monsanto from 1957 to 1977. Hazardous and non-hazardous bulk liquid and solid chemical wastes and drummed chemical wastes from Monsanto's W.G. Krummrich plant and, to a lesser degree its Queeny plant in St. Louis, were disposed of at the site. Disposal began in the northern portion of the site and expanded southward. Wastes contained toluene, xylenes, poly-aromatic hydrocarbons (PAHs), chlorobenzenes, chlorophenols, pentachlorophenol (PCP), chloroanilines, phenols, aromatic nitro compounds, aromatic amines, aromatic nitro amines, chlorinated aromatic hydrocarbons, aromatic and aliphatic carboxylic acids, and condensation products of these compounds.

Pursuant to a negotiated agreement with the State of Illinois, Monsanto installed a clay cap on Site R in 1979 to cover the waste, limit surface water infiltration through the landfill, and prevent direct contact with the landfill material. The cap thickness ranges from 2 feet to approximately 8 feet. In 1985, Monsanto installed a 2,250 foot long rock revetment along the east bank of the Mississippi River downgradient of Site R. The purpose of the stabilization project was to prevent further erosion of the riverbank and thereby minimize potential for the release of waste material from the landfill. During a flood in 1993, Site R was flooded but the clay cap was not overtopped. No erosion of the Site R riverbank or cap resulted from this flood.

In 2000, EPA entered into an Administrative Order on Consent (AOC) with the PRPs to conduct a remedial investigation/feasibility study (RI/FS) at the five waste disposal Sites (O,P,Q,R, and S) to investigate and assess what clean-up remained to be done for the Site after the above referenced actions were completed. Under the AOC, the PRPs conducted RI activities from June 2002 through October 2002, with EPA and Illinois EPA oversight. A draft RI/FS report was submitted by the PRPs to EPA in 2004. Based upon its review of the draft RI/FS report, EPA determined that supplemental investigation (SI) work was necessary to fill data gaps. The supplemental investigation work consisted of the following: completion of supplemental field investigations; installation of monitoring well clusters; investigation of non-aqueous phase liquids (NAPL[8]), vapor intrusion[9], and principal threat wastes; and completion of a regional fate

[8] NAPLs are "non-aqueous phase liquids" that do not mix readily with water and therefore flow separately from ground water, acting as a continual source of groundwater contamination until they are removed or dissipate. Many contaminants, including chlorinated solvents and petroleum products, enter the subsurface in the form of an oily liquid, known as a NAPL.

[9] Certain hazardous chemicals that are released into the subsurface as liquids or solids may form hazardous gases (i.e., vapors) that migrate through the vadose zone and eventually enter buildings as a gas by migrating through cracks and gaps in basement floors and walls or foundations, including perforations due to utility conduits and any other openings (e.g., sump pits). Vapor intrusion is the general term given to migration of hazardous vapors from any subsurface contaminant source, such as contaminated soil or groundwater, through the vadose zone and into indoor air.

and transport groundwater model to fill data gaps in the RI/FS. During the RI and SI from 2002 through 2007, the PRPs conducted extensive Site investigations of the disposal areas, groundwater, surface water, air, waste, and soil. EPA evaluated results of these investigation studies in the Final FS Report for Sauget Area 2 (May 2013).

Additionally, during this time period, EPA determined that an interim response action was necessary to address on-going releases into the Mississippi River. In September 2002, EPA signed the ROD for the groundwater operable unit (OU2) of the Sauget Area 2 Superfund Site, which selected an interim groundwater remedy for the Sauget Area 2 Site to address the release of contaminated groundwater into the Mississippi River. Subsequently, in October 2002, EPA issued a UAO to the Sauget Area 2 Site PRPs for Remedial Design and Interim Remedial Action associated with the Sauget Area 2 interim groundwater remedy. The two main components of the remedial action called for in the Sauget Area 2 OU2 interim ROD were the construction of the barrier wall and the installation of three groundwater recovery wells. The wall, together with the extraction wells, is referred to as the Groundwater Migration Control System, or GMCS. Although the three extraction wells are intended to be the principal groundwater control measure, the barrier wall serves to reduce the volume of groundwater flowing into the extraction system from the Mississippi River during operation of the extraction wells, thereby reducing operation and maintenance (O&M) costs by reducing the volume of water treated. The PRPs began construction of the interim remedy in 2003 and completed construction in 2005, at the cost of approximately $27,000,000. Annual operation and maintenance costs for the GMCS are estimated to be $2,000,000 per year.

The Sauget Area 2 GMCS was designed to abate adverse impacts on the Mississippi River resulting from the discharge of groundwater from Sauget Area 2 Sites O, Q North, R, and S; the former Clayton Chemical facility site; Sauget Area 1 Sites G, H, I South, and L; the southern portion of the W.G. Krummrich Facility (which is also being addressed under RCRA Corrective Action); and other industries in the Sauget area.

The major components of the OU2 interim groundwater remedy include the following, subject to several EPA-approved changes to optimize the construction and operation of the barrier wall and pumping system:

- Physical Barrier - A 3,500 foot long, "U"-shaped, fully penetrating, bentonite slurry[10] barrier wall installed between the downgradient boundary of Sauget Area 2 Site R and the Mississippi River to abate the release of impacted groundwater. The barrier wall was installed to the top of the bedrock surface (approximately 120 to 140 feet deep). The purpose of the barrier wall is to minimize the volume of groundwater that needs to be extracted;

- Groundwater Extraction - Three partially penetrating groundwater recovery wells inside the "U"-shaped barrier wall to abate groundwater moving to the wall;

[10] In July 2003, EPA signed an Explanation of Significant Differences (ESD) to modify the OU2 interim remedy. The ESD documented that a conventional soil-bentonite slurry barrier wall would be constructed instead of a jet grouted barrier wall. This change did not affect the overall scope of the interim remedy.

- Groundwater Treatment - Once extracted, the contaminated groundwater is treated at the American Bottoms Regional Water Treatment Facility (ABRTF) prior to being discharged to the Mississippi River. ABRTF provides primary treatment as well as secondary biological treatment enhanced by powdered activated carbon;

- Groundwater Quality Monitoring - Groundwater samples from wells located between the barrier wall and the River are collected periodically. Concentrations of key compounds are plotted over time to determine and track long-term trends;

- Groundwater Level Monitoring - Groundwater level monitoring is performed to ensure acceptable performance of the physical barrier;

- Surface Water Monitoring - Surface water samples are collected in the plume release area to determine the effect of any contaminants migrating through, past, or beneath the barrier wall and being released to the Mississippi River; and

- Institutional Controls - Institutional controls are used to limit access to Site R and Mississippi Riverby existing fencing at Site R, a very steep riverbank, and the absence of public roads leading to this area.

The GMCS intercepts and captures an estimated 210 million gallons of contaminated groundwater a year, which is pumped to the ABRTF in Sauget, Illinois. The groundwater is treated at the ABRTF and ultimately discharged to the Mississippi River in compliance with the terms and conditions of the ABRTF's National Pollutant Discharge Elimination System (NPDES) permit issued under the Clean Water Act. Sampling has indicated that the implemented interim groundwater remedy has addressed on-going ecological risk to the Mississippi River.

Currently, access to Site R is restricted by a perimeter fence surrounding the site and monitored by the PRPs (URS, April 2002b).

Site S - In the mid-1960s, wastes from the former Clayton Chemical property were disposed of in a shallow, on-site excavation which is now designated as disposal Site S. The wastes were from the solvent recovery process at Clayton which involved steam-stripping. Still bottoms from the stripping process were disposed of at the site.

Currently, the northern portion of Site S is covered with grass and the remainder of the site is covered with crushed rock and the site is fenced.

Former Clayton Chemical Site - The former Clayton site, referred to as the "RRG/CCC Site" is located at 1 Mobile Avenue, Sauget, Illinois. The RRG/CCC Site is approximately 7 acres in size and is situated due east of Sauget Area 2 Site R and the northern portion of Sauget Area 2 Site Q. The site is located within, but is not a formally designated Sauget Area 2 Site. In its early history, the site served as a railroad roundhouse and starting in the 1960s until 1998, a solvent and waste oil recovery facility.

In June 2001, EPA conducted a site assessment at the RRG/CCC Site. The site assessment indicated soil contamination (including elevated concentrations of solvents, heavy metals,

ignitable compounds, and PCBs) from the release of hazardous substances into the environment. In addition, containers remaining at the RRG/CCC Site were found to contain hazardous substances. Based on the porous, sandy nature of the soil at the site, EPA concluded that hazardous substances could migrate into the groundwater. In October 2002, EPA and a number of the PRPs for the RRG/CCC Site entered into an AOC which required the signatories to the AOC to conduct a time critical removal action. The action involved the removal of all liquid hazardous substances contained in drums, tanks, containers, and other vessels at the RRG/CCC Site. The RRG/CCC Site AOC signatories performed this removal action between 2002 and 2004. In October 2005, EPA and numerous RRG/CCC Site PRPs entered into another AOC requiring the signatories to characterize, remove, and properly dispose of hazardous substances (solids and contaminated soils) located at the RRG/CCC Site. Additional PRPs were added in an amendment to this AOC in January 2006. Soil capping and operation and maintenance plan requirements were added in an AOC amendment in January 2008. On December 22, 2006, EPA issued General Notice of Potential Liability Letters for the Sauget Area 2 Sites to RRG/CCC Site PRPs based upon the downgradient migration of contaminated groundwater from the RRG/CCC Site into the Sauget Area 2 Sites. In March 2008, EPA issued a UAO to certain RRC/CCC Site PRPs requiring the UAO recipients to construct a cap over hazardous substances in soils remaining on the RRG/CCC Site. The construction of the cap has been completed.

2.3 – Community Participation

In June 2013, EPA made available to the public the RI and FS Reports and the Proposed Plan for the Sauget Area 2 Site. These documents can be found in the Administrative Record for the Site. The Administrative Record is maintained at two public repositories: the EPA Region 5 Docket Room, 77 West Jackson Boulevard (7th Floor) Chicago, Illinois, and the Cahokia Public Library, 140 Cahokia Drive, Cahokia, Illinois. The Proposed Plan set forth the remedial alternatives for the Site and EPA's proposed remedial action for OU1. After issuing the Proposed Plan, EPA held a public comment period between June 7 and July 8, 2013. When the Proposed Plan was issued, EPA mailed a fact sheet to area residents informing them about the Proposed Plan. The fact sheet advised residents that the RI and FS Reports and Proposed Plan were available for viewing at the public repositories. The fact sheet included the date, time, and location of the public meeting. At the public meeting on June 12, 2013, EPA and Illinois EPA representatives answered questions about the Site and the remedial alternatives. EPA's responses to the comments received during the public comment period are included in the *Responsiveness Summary*, which is Part 3 of this Record of Decision.

2.4 - Scope and Role of Operable Unit or Response Action

As with many Superfund sites the problems at the Sauget Area 2 Site are complex. The Sauget Area 2 Site consists of 4.5 million cubic yards of contaminated soil and wastes located near the Mississippi River, where the water table across the Site is approximately 10 feet below ground surface (bgs). Therefore, most of the waste from the various sites in Area 2 is located under the area groundwater table, and the rising and falling River levels cause the water table to fluctuate, creating a flushing effect in the waste areas.

Also potentially effecting Site conditions is the U. S. Army Corps of Engineers (USACE) proposal to install relief wells from levee stations 1113+00 to 1116+00 and 1133+00 to 1135+00 within the Metro East Sanitary District levee system as part of its Illinois Flood Protection Project. Relief wells are groundwater wells, which are used for flood control. Relief wells are installed adjacent to earthen levees to relieve the pressure on the river side of the levee and thus to prevent the collapse of the levee during flooding. The greater flow of water in the river during a flood creates a pressure gradient such that more water infiltrates the soil of the levee. Water may then flow through the soil towards the dry side of the levee, resulting in liquefaction of the soil, and ultimately destruction of the levee. Relief wells act like valves to relieve the water pressure and allow excess water to be diverted safely.

The USACE's project area includes areas where groundwater contamination from historical industrial activities is present, including the Sauget Area 2 Site. The Illinois Flood Protection Project is necessary to protect the people living in the surrounding area during a significant flooding event. EPA is working with the U.S. Army Corps of Engineers on this project and has provided them with information about the Site and with groundwater data for the region so that this information known as the relief well project is planned and implemented in areas containing contaminated groundwater.

In order to address this complex Site, EPA has organized the work into two operable units (OUs):

- Operable Unit 1: Contamination of the on-Site soils, sediments, surface water, and groundwater source areas
- Operable Unit 2: Contamination of the groundwater aquifer

The Selected Remedy, referred to as remedial action for OU1, will be the first of two remedial decisions for the Sauget Area 2 Site. EPA's overall strategy for cleaning up the Site is to first address soil, sediment, surface water, and groundwater source contamination through this remedial action for OU1, which will be the final remedy for these media at the Site. Area-wide groundwater contamination resulting from the contaminated soil, sediments, surface water, and groundwater contamination source areas present in the Sauget Area 1 and 2 Sites will be addressed as a separate remedial action. That remedial action will be selected in a separate and subsequent ROD for groundwater contamination in Sauget Areas 1 and 2, after the remedies set forth in the source area RODs for Areas 1 and 2 are implemented.

2.5 – Site Characteristics

2.5.1 - Conceptual Site Model

To guide identification of appropriate exposure pathways and receptors for evaluation in the risk assessment, a conceptual site model (CSM) for human health was developed. The purpose of the conceptual site model is to provide a framework with which to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors.

A general identification of exposure pathways, exposure routes, and receptors is illustrated in the conceptual site model in Figure 2. A more detailed discussion of the receptor/area matrix for the Sites (O, O North, O South, P, Q North, Q Central, Q South, R, and S) and the Mississippi River is provided below.

Sites

The Sauget Area 2 Sites (O, O North, O South, P, Q North, Q Central, Q South, R, and S) have been used for industrial purposes for many years (since the 1930s or earlier). The sites are zoned commercial/industrial and it is likely that the sites will continue to be used well into the reasonably foreseeable future for commercial/industrial purposes. Therefore, the sites were evaluated for non-residential use scenarios in the Site-wide human health risk assessment (HHRA) (AECOM, 2009).

Receptors were identified for the sites based on the CSM and the constituents of potential concern (COPCs) identified in media in the sites. COPCs are a subset of the complete list of constituents detected in site media that are carried through the quantitative risk assessment process. COPCs were identified in groundwater in Sites O, Q Central, Q South, R, and S; in leachate in Sites O North, Q North, and R; and in soils in all sites, except for surface soil in Site O South and Site R. COPCs were identified in surface water, sediment, and fish fillets in the Site Q South Ponds.

Due to the presence of volatiles in the subsurface of the sites, an on-Site indoor industrial worker scenario was evaluated in the Vapor Intrusion HHRA (ENSR, 2008) for potential exposure to COPCs via inhalation of volatile constituents present in indoor air due to vapor intrusion from the subsurface. Buildings found with potentially complete vapor intrusion pathways, were sampled during the vapor intrusion investigation. These buildings included four buildings located on Site Q North, five buildings located on Site Q Central, one building located on Site P, one building located off-Site but near Site O, and one building located off-Site but near Site S. No buildings with potentially complete vapor intrusion pathways were identified in Site O North, O South, Q South, or R. An on-Site outdoor industrial worker scenario was evaluated for potential exposure to COPCs in surface soil via incidental ingestion and dermal contact, and via inhalation of non-volatile COPCs that may be suspended as dusts from surface soils. Additionally, these receptors were re-evaluated for potential exposure to COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste).

An on-Site construction/utility worker scenario was evaluated for potential exposure to COPCs in combined soils via incidental ingestion and dermal contact, and via inhalation of particulates suspended during excavation activity as well as volatile emissions. Construction/utility work was assumed to occur up to depths of 15 feet below ground surface (bgs). Due to the shallow depth of groundwater in limited areas, the construction/utility worker may contact groundwater during excavation. Therefore, the construction worker was assumed to be exposed to COPCs in shallow groundwater via incidental ingestion and dermal contact, and via inhalation of COPCs volatilized from standing water in an excavation trench. COPCs in shallow groundwater and leachate were identified in Sites O, O North, Q Central, Q North, Q South, R, and S.

A trespassing teenager scenario was evaluated for potential exposure to COPCs in surface soil via incidental ingestion and dermal contact; via inhalation of non-volatile COPCs that may be suspended as dusts from surface soils; COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste); and to COPCs in surface water and sediment from the Site Q South Ponds.

Additionally, the recreational angler scenario was evaluated for potential exposure to COPCs in fish fillet from the Site Q South Ponds.

Mississippi River
Recreational angler and trespassing teenager scenarios were evaluated for potential exposure to COPCs in sediment and surface water in the Mississippi River. In addition, the recreational angler was evaluated for potential exposure to fish fillet from the Mississippi River. Both receptors were evaluated for potential exposure to seeps into the Mississippi River in Sites Q and R.

2.5.2 - Overview of Site

The Sauget Area 2 Site covers approximately 312 acres situated in a floodplain of the Mississippi River called the American Bottoms. Topographically, the area consists primarily of flat bottomland. The Site is adjacent, or in close proximity, to the Mississippi River. Two of the Sites, Sites Q and R, are located on the wet-side of the floodwall and levee, which is operated and maintained by the USACE and the Metro East Sanitary District. The floodwall is designed to protect the City of East St. Louis and the Villages of Sauget and Cahokia from flooding from the Mississippi River. Sites O, P, and S are located on the dry-side of the floodwall and levee.

Collectively, Sites O (including Site O North and O South), P, Q (including Q North, Q Central, Q South), R, and S contain an estimated 4.5 million cubic yards of soil and waste. Site Q is the largest disposal area with an estimated waste volume of 2.6 million cubic yards, followed by Site P with 1 million cubic yards, Site R with 594,000 cubic yards, Site O with 272,000 cubic yards, and Site S with 8,000 cubic yards. All of these sites were formerly used for industrial/municipal waste disposal.

2.5.3 - Geologic and Hydrogeologic Setting

The Sauget Area 2 Site is situated in the American Bottoms floodplain of the Mississippi River. More specifically, it is situated south of East St. Louis along the eastern bank of the Mississippi River. In total, the American Bottoms floodplain encompasses 175 square miles, is 30 miles long, and has a maximum width of 11 miles. It is bordered on the west by the Mississippi River and on the east by bluffs that rise 150 to 200 feet above the valley bottom. The floodplain is relatively flat and generally slopes from north to south and from east to west. Land surface lies between 400 and 445 feet above mean sea level (msl).

The stratigraphy beneath the Sauget Area 2 Site is much like that of the rest of the floodplain. The Cahokia Alluvium is approximately 40 to 50 feet thick and exists as a fine, silty sand that is

gray and brown in color. Below this, the unconsolidated deposits of the Henry Formation are present.

Locally, the Henry Formation is characterized by medium-to-coarse sand that becomes coarser and more permeable with depth. The depth to bedrock (below ground surface) ranges from 140 feet near the River and Sauget Area 2 Sites to about 100 feet on the east side of the Sauget Area 1 Site. The groundwater level is currently between 20 to 40 feet below ground surface, but fluctuates considerably throughout the year. Figure 3 presents a generalized geologic cross-section.

Three distinct hydrogeologic units are present in the Sauget Area 2 and Area 1 Sites: 1) a shallow hydrogeologic unit (SHU); 2) a middle hydrogeologic unit (MHU), and 3) a deep hydrogeologic unit (DHU). The 30 foot thick SHU includes the Cahokia Alluvium and the uppermost portion of the Henry Formation. This unit is primarily unconsolidated, fine-grained silty sand with low to moderate permeability. The 40 foot thick MHU is formed by the upper to middle, medium to coarse sand portions of the Henry Formation. It contains higher permeability sand than found in the overlying shallow hydrogeologic unit, and these sands become coarser with depth. At the bottom of the aquifer is the DHU, which includes the high permeability, coarse-grained deposits of the lower Henry Formation. This zone is estimated to be about 30 to 40 feet thick. Groundwater flow velocity is on the order of 0.02 feet per day (7 feet per year) in the SHU, 4 feet per day (1,500 feet per year) in the MHU, and 6 feet per day (2,200 feet per year) in the DHU. Groundwater beneath Sauget Area 2 generally flows from east to west, toward the Mississippi River.

During low River stage conditions, groundwater at Sauget Area 2 flows from east to west and releases to the Mississippi River, the natural point of release for groundwater in the American Bottoms aquifer. When flood stage occurs in the Mississippi River, flow reverses. Under these conditions, groundwater flows from west to east.

2.5.4 - Sampling Strategy

On November 20, 2000, the PRPs signed an AOC with EPA to perform a remedial investigation/feasibility study at five discrete waste disposal sites (Sites, O, P, Q, R, and S) on the Sauget Area 2 site. The PRPs submitted the draft RI/FS report to EPA in January 2004. Upon review of the RI/FS report, EPA determined there were data gaps in the RI/FS report and supplemental investigations (SIs) were required in order to fill identified data gaps.

The following summarizes the RI and Supplemental Investigations. SIs are included in the RI and FS Reports.

Remedial Investigations

Initial sampling and remedial investigation work, undertaken by the PRPs in 2002-2003 under the November 20, 2000 RI/FS Order, with EPA oversight, is presented below:

Disposal Area Characterization Sampling - Surface soil and subsurface soil/waste samples were collected from borings taken at each of the disposal areas (Sites O, P, Q, R, and S) in order

to characterize the depth and types of wastes present at each site and to evaluate potential exposures for the human health risk assessment including the outdoor industrial worker and construction/utility worker exposure scenarios. Additional activities included determination of disposal area boundaries using historical air photo analysis, soil gas surveys, and test trenching and identification of buried tanks and/or drums using magnetometer surveys and test trenches. Ambient air sampling was conducted upwind and downwind of the sites to determine the tendency of Site constituents to enter the atmosphere and local wind patterns. Air sampling data were subsequently evaluated in the HHRA outdoor industrial worker, construction/utility worker and trespassing teenager exposure scenarios.

Additionally, leachate wells were installed at the waste boring location within each site (three were installed at Site Q), which had the greatest indications of potential impact or the greatest depth of waste materials. Leachate samples were collected during the RI in order to assess the impact of contaminated soils and waste to groundwater.

In the original Sauget Area 2 (SA2) RI/FS document which was submitted in January 2004, the HHRA and the Baseline Ecological Risk Assessment (BERA) indicated that the ponds located in Site Q South represented a significantly different exposure potential than the surrounding non-pond area of Q South. As a result, the ponds were treated as a separate area, identified as Q South Ponds.

Groundwater Sampling - Groundwater samples were collected to define the horizontal and vertical distribution of constituents in the alluvial aquifer beneath the sites and provide information for two HHRA exposure scenarios; volatilization from groundwater to outdoor air for the outdoor industrial worker and construction/utility worker, and vapor intrusion into buildings for the indoor industrial worker. In addition, groundwater samples were collected from weathered bedrock beneath the sites to determine the vertical extent of migration from these source areas.

Groundwater flow direction was determined by installing water-level measurement piezometers in each of the three hydrogeologic units present in Sauget Area 2 and measuring groundwater-level elevations. Aquifer hydraulic conductivity was measured by conducting slug tests in piezometers completed in each of the hydrogeologic units. Aquifer grain size analyses were also performed on soil samples collected from each hydrogeologic unit.

Surface Water, Sediment, and Biota Sampling - Surface water, sediment, and biota samples were collected from the Mississippi River and the two ponds located on Site Q South to determine the extent of downstream migration of Site-related constituents and provide information for use in the HHRA (trespassing teenager and trespassing angler exposure scenarios) and the ecological risk assessment (potential ecological receptor exposures).

Additionally, in order to assess the presence of seeps and their impacts on the Mississippi River, seep grab samples were collected from one location at Site R and two locations at Site Q. A visual reconnaissance survey was conducted along the riverbank adjacent to both Sites Q and R, to identify potential sample locations. Stormwater run-off samples were also collected from two

downgradient locations at Site Q and one location at Site R to characterize run-off from the site during storm events.

Supplemental Investigations

After completion of the RI, SI field activities were performed during 2005 and 2006 through a phased approach (Phase 1, 2, and 3). Phase 1 was conducted to fill identified data gaps in the RI. Phase 2 was conducted to fill remaining data gaps associated with the groundwater impact observed at the sites. And Phase 3 consisted of a NAPL investigation to identify the nature and extent of both residual NAPL remaining in the interstitial spaces of the soil and pooled NAPL sitting on the groundwater and bedrock surfaces. In addition, a vapor intrusion investigation was completed in 2007 of occupied buildings within or near the boundaries of the sites in order to evaluate vapor intrusion as part of the HHRA.

The PRPs, with EPA oversight, performed an erosion and release aerial photo analysis in order to determine: (1) the potential for future erosion and release at Sites Q and R resulting from a flood event; (2) anomaly trenching to investigate the potential presence of buried drums or tanks based on the magnetic anomalies, and (3) soil gas concentration highs identified during the magnetometer and soil gas investigations conducted as part of the RI.

A regional survey of NAPL and potential NAPL was completed during groundwater sampling activities. Based on the NAPL survey and previous investigation results, additional NAPL investigations were conducted at Sites P and Q North. These investigations included collection of NAPL samples from the leachate well (LEACH P-1) located on Site P and advancement of soil borings and installation of monitoring wells around the regional groundwater monitoring well (Sonic-5) located on Site Q North. Soil borings and monitoring wells were not advanced or installed adjacent to LEACH P-1 because other sampling locations have provided a maximum lateral extent of NAPL observed.

Groundwater Investigations

During Phase 1 of the Sauget Area 2 SI, groundwater samples were collected from monitoring wells throughout the region. This included monitoring wells at Sauget Area 2 sites, Sauget Area 1 sites, the W.G. Krummrich facility, and the Conoco Phillips bulk storage terminal. In addition, groundwater samples were collected from 26 groundwater monitoring wells installed during Phase 2 of the Sauget Area 2 SI. Groundwater quality data from these 2005/2006 sampling programs were used for calibration of the Regional Groundwater Fate and Transport Model (GSI, 2008b).

The Regional Groundwater Fate and Transport Model was developed during the RI and SI and covers the southern portion of the American Bottoms aquifer. The fate and transport model was used to simulate the movement of groundwater plumes from the sources zones in order to characterize and define the nature and extent of groundwater contamination from the Sauget Area 1 and 2 Sites. At the request of EPA and Illinois EPA, the PRPs re-ran the model in 2012 to account for new information on pumping rates and duration of operation of the Illinois

Department of Transportation highway dewatering wells (GSI, 2012). If necessary, the model can be updated to account for changes in Site conditions, as was done in 2012.

Additionally, groundwater samples were collected from the leachate wells to determine if leaching from the disposal areas to groundwater was a migration pathway.

Vapor Investigation

The PRPs, with EPA oversight, conducted a vapor intrusion investigation and evaluation as part of the baseline HHRA for the sites. The purpose of the vapor intrusion evaluation was to determine whether volatiles and semi-volatiles (VOCs and SVOCs) detected in the subsurface air within the Sauget Area 2 Sites have potential inhalation risk associated with the vapor intrusion pathway. Only buildings with a potentially complete vapor intrusion pathway were evaluated (i.e., enclosed structures, not trailers).

Soil gas samples were collected and evaluated from 13 buildings on the Site. These buildings included four buildings located on Site Q North, five buildings located on Site Q Central, one building located on Site P, one building located off-Site but near Site O, and one building located off-Site but near Site S. No buildings with potentially complete vapor intrusion pathways were identified in Site O North, O South, Q South, or R. Therefore, no vapor intrusion sampling was conducted on these Sites. Vapor intrusion sampling was conducted in the buildings located in or near Sites O, Q North, Q Central, P and S which had potentially complete vapor intrusion pathways.

Flood Study

In 2011, at the request of EPA and Illinois EPA, the PRPs completed a flood study of Sauget Area 2 Sites R and Q (*Quantitative Analysis of Flood Velocities for Superfund Sites R and Q during the 100-Year Flooding Event*, CDG Engineers, April 2011). The study evaluated the effects of a 100-year flooding event at the Site, specifically at Sites Q and R, which are the only sites that border the Mississippi River. The 100-year flooding event was also analyzed to determine the potential for erosion.

The study concluded that during a 100-year flood event, maximum velocities calculated did not exceed 2 feet per second during the flooding event. Areas of potential concern during the 100-year flooding event include the fringes of a small sand stockpile in Site Q Central and the alluvial silts in the ephemeral ponds in Site Q South. Concerning the potential for erosion, the central portion of Site Q (Q Central) is shown to be stable due to the presence of the compacted crushed limestone covering most of this portion of Site Q. The majority of Site R was above the water surface profile for the 100-year flooding event.

2.5.5 - Sources of Contamination

The contaminant source areas at the Sauget Area 2 Site are the disposal areas at Sites O, O North, O South, P, Q North, Q Central, Q South, R, and S. These disposal areas contain

municipal and industrial waste materials, including crushed or partially crushed drums, drum fragments, construction debris, and miscellaneous trash.

Based on the nature and extent of source areas at the Sauget Area 2 Site, the following were identified as potential routes of contaminant migration:

- Leaching of source materials to groundwater;
- Groundwater flow and discharge to the Mississippi River and GMCS;
- Volatilization of source materials to ambient air and to indoor air where buildings are present; and
- Erosion and release of source materials

Leaching to Groundwater

The potential for the source material at the various sites to leach to the groundwater has been based upon the leachability of the source material, the age and relative amount of leaching that has already occurred, and the surface cover. The source material observed in the Sauget Area 2 Sites generally consists of constituents that are relatively leachable. However, due to the age of waste material and the presence of clay layers, and based on the observed analytical concentrations in the soil, waste, and upper groundwater samples, wastes present at Sites O, P, Q Central, Q South, and S are contributing a minor degree of constituent migration from the sites into the underlying aquifer. There is most likely constituent migration from Sites Q North and R into the underlying aquifer; however, groundwater from Sites Q North and R is captured by the GMCS.

Groundwater Flow

The groundwater flow to the Mississippi River and to the GMCS has been extensively studied and modeled. In addition, the effectiveness of the GMCS has been monitored on a semi-annual basis since the remedy was installed. The surface water samples collected during the semi-annual sampling events that have been conducted since the GMCS became operational indicate reduced concentrations of the five indicator constituents in surface water when compared to 2002 data. This trend indicates the barrier wall is capturing 98 percent of mass flux from impacted groundwater from the Sauget Area 2 Sites and 94 percent of the total plume mass flux from Sauget Area 1, Sauget Area 2, Clayton Chemical, and the W. G. Krummrich facility which would have migrated into the Mississippi River without the GMCS.

Volatilization

Volatile constituents present in the subsurface of the sites may potentially volatilize to ambient air or, where buildings are present, to the indoor air of overlying buildings (i.e., vapor intrusion). The potential for constituents to volatilize from soil or groundwater to ambient air is dependent on soil characteristics (i.e., soil type, fraction of organic carbon), the depth of the constituents, and the presence of low permeability caps, which would limit volatilization. The potential for constituents to volatilize to indoor air is dependent on soil type as well as the characteristics of the building in question (i.e., size, air exchange rate). Under the current exposure scenario, vapor intrusion is a potentially complete pathway only where buildings are present. No buildings with potentially complete vapor intrusion pathways were identified in Site O North, O South, Q South, or R.

Erosion

Significant erosion will only result from flooding by the Mississippi River. Sites O, P, and S are protected by the Mississippi River levee system and no indications of erosion and release events due to flooding of the Mississippi River were observed on historic aerial photographs of Sites O, P, and S. Sites Q and R are located within the Mississippi River floodway. Portions of Site Q and R have been flooded on multiple occasions. In 2011, at the request of EPA and Illinois EPA, the PRPs completed a flood study of Sauget Area 2 Sites R and Q (*Quantitative Analysis of Flood Velocities for Superfund Sites R and Q during the 100-Year Flooding Event*, CDG Engineers, April 2011). The study conclusions are discussed above in the Section 2.5.4.

2.5.6 - Types of Contaminants and Affected Media

Various investigations have been conducted to determine the nature and extent of contamination present in various media including surface soil, subsurface soil/waste, groundwater, surface water/sediment, leachate, and air at the Sites. Nature and extent of contamination for soils and waste at the Sauget Area 2 Sites are defined based on: 1.) five indicator constituents (benzene, chlorobenzene, 1,4-dichlorobenzene, 2,4-dichlorophenol, and p-chloroaniline); 2.) constituents with concentrations greater than Illinois EPA's Tiered Approach to Corrective Action Objectives (TACO) Class I Groundwater Standards in the uppermost groundwater; and 3.) constituents with concentrations greater than 100 times Illinois EPA's TACO Class I Protection of Groundwater Soil Remediation Objectives (SROs). Indicators of potential impacts to groundwater were defined as the presence of constituents in soil at concentrations greater than 100 times Illinois TACO concentrations. The five indicator constituents were chosen because they were the most widely distributed constituents with the highest concentrations in the groundwater.

In addition to the five indicator constituents, PCBs and dioxins were also sampled for during the RI. PCB and dioxin sample results are summarized below in Tables 2 and 3, respectively.

Table 2: Minimum and Maximum PCB Concentrations in Surface and Subsurface Soil and Wastes

Site	Surface Soil (ppm)		Subsurface (ppm)	
	Min	Max	Min	Max
O	0	300	0	990
P	0	2.2	0	9.6
Q North	0	0.92	0	90
Q Central	0	0.53	0	1.7
Q South	0	5.6	0	10
R	0	0	0	130
S	0	370	0	20

Table 3: Minimum and Maximum Dioxin Concentrations in Surface and Subsurface Soil and Wastes				
Site	Surface Soil (ppb)		Subsurface (ppb)	
	Min	Max	Min	Max
O	0.16	1.9	1.9	10
P	0	0	1.5	68
Q North	0.33	0.33	1.4	1.4
Q Central	0.48	0.48	1.0	1.0
Q South	0.35	1.4	1.1	1.8
R	--	--	2.8	330
S	0.15	0.15	0.7	20

The detection of indicator constituents for Sites O, P, Q, R, and S are summarized below in Tables 4 through 16.

2.5.7 - Extent of Contamination

The following summarizes the extent of remaining contamination at the Site:

Disposal Area Waste Characterization

Disposal area waste characterization investigations completed during the RI included soil gas and magnetometer surveys, installation of test trenches and borings, and waste characterization samples. Waste materials encountered at Sites O, P, Q, R, and S consisted of municipal and industrial waste materials, construction debris, and miscellaneous trash. All four boundaries of Sites O, P, Q, R, and S identified by aerial photo analysis were confirmed by soil gas surveys (VOCs detected inside the boundaries but not outside) and by boundary trenching.

Soil and waste characterization results for each of the sites are summarized below:

Site O

Surface Soil - Benzene, chlorobenzene, ethylbenzene, and pentachlorophenol were found in samples at levels that exceeded 100 times the TACO SROs, which is summarized in Table 4 below. At Site O North, benzene, chlorobenzene, 2,4,6-trichlorophenol, tetrachloroethene, and pentachlorophenol were found in samples that exceeded 100 times the TACO SROs. At Site O South, the only constituent that exceeded 100 times the TACO SRO was pentachlorophenol and only at one location.

Table 4- Site O: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes								
Indicator Constituents	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	7	11	1.1	1,100	243	30	3,000
Chlorobenzene	µg/kg	4	11	4.7	14,000	4,956	1,000	100,000
1,4-Dichlorobenzene	µg/kg	3	11	46	630	265	2000	200,000
2,4-Dichlorophenol	µg/kg	3	11	35	940	385	1,000	100,000
P-Chloroaniline	µg/kg	1	11	77	77	77	700	70,000
2,4,6-Trichlorophenol	µg/kg	2	11	160	1,300	730	200	20,000
Ethylbenzene	µg/kg	7	11	0.38	4,400	815	13,000	1,300,000
Pentachlorophenol	µg/kg	11	11	13	480,000	46,424	30	3,000
Tetrachloroethene	µg/kg	4	11	1	290	116	60	6,000

Subsurface Soil and Waste – Constituents that exceeded TACO SROs and 100 times the TACO SROs at Site O in subsurface soil and wastes are summarized in Table 5 below. The estimated volume of waste and soil that exceeded the TACO SROs at Sites O, O North, and O South was calculated to be approximately 50,000 cubic yards[11].

Table 5- Site O: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	13	16	1.5	500,000	58,481	30	3,000
Chlorobenzene	µg/kg	13	16	65	760,000	218,520	1,000	100,000
1,4-	µg/kg	9	15	1,800	180,000	58,433	2000	200,000

[11] The estimated volume of waste and soil that exceeded the TACO SROs is calculated based on average depth of fill material and surface area exceeding TACO SROs.

Table 5- Site O: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Dichlorobenzene								
2,4-Dichlorophenol	µg/kg	5	15	4,400	33,000	16,280	1,000	100,000
P-Chloroaniline	µg/kg	4	15	63	5,800	1,862	700	70,000
2,4,6-Trichlorophenol	µg/kg	8	15	1,100	61,000	14,338	200	20,000
Ethylbenzene	µg/kg	14	16	1.1	2,800,000	375,555	13,000	1,300,000
Pentachlorophenol	µg/kg	7	16	2,900	7,900,000	1,941,843	30	3,000
Tetrachloroethene	µg/kg	3	16	2,400	6,800	4,067	60	6,000

Leaching to Groundwater- At Sites O, O North, and O South, the analytical results indicate minimal leaching is occurring to the shallow hydraulic unit (SHU) from the waste due to the following:

- The surface of Site O consisted of an approximately 3.5 foot thick clay cover. Additionally, clay layer beneath the site, with a minimum thickness of one foot is present underlying most of the observed waste or shallow subsurface material at Sites O, O North, and O South. The clay cover and the clay layer under the waste act as a deterrent to leaching.
- Concentrations of uppermost groundwater from potential source areas and immediately downgradient of Sites O, O North, and O South were not indicative of a significant source.
- Shallow groundwater concentrations are two to three orders of magnitude lower than leachate concentrations.

The amount of migration into the groundwater system from Site O is minimal. In addition, the regional groundwater flow and transport model indicate that the plumes in the MHU and DHU under Site O are captured by the GMCS.

Vapor - No buildings with potentially complete vapor intrusion pathways were identified on Site O. No occupied or nearby buildings were present at Site O North; therefore, the vapor intrusion pathway was incomplete at Site O North.

Erosion- Site O is located on the east side (dry side) of the levee. Therefore, the potential for Site O to be affected by a flood event that could result in the erosion and release of the source material is controlled.

Principal Threat Wastes- No NAPL or buried drums were observed at Site O, O North, or O South, as documented in the Principal Threat Wastes Technical Memorandum (URS, 2008b).

Site P

Surface Soil - Surface soil exceedances of the TACO SROs were found only at one sample location, in which P-chloroaniline exceeded the TACO SRO and tetrachloroethene exceeded 100 times the TACO SRO, as summarized in Table 6.

Table 6- Site P: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes

Chemical	Units	No. of Detects	No. of Samples	Min Conc	Max Conc	Avg Conc	IEPA TACO Class I SROs	100X IEPA TACO Class I SROs
Benzene	µg/kg	5	10	0.92	9.4	4.7	30	3,000
Chlorobenzene	µg/kg	4	11	3	540	138	1,000	100,000
1,4-Dichlorobenzene	µg/kg	0	11	--	--	--	2000	200,000
2,4-Dichlorophenol	µg/kg	0	11	--	--	--	1,000	100,000
P-Chloroaniline	µg/kg	1	11	21,000	21,000	21,000	700	70,000
Ethylbenzene	µg/kg	6	11	0.26	800	136	13,000	1,300,000
Tetrachloroethene	µg/kg	5	11	1.9	59,000	11,803	60	6,000

Subsurface Soil and Waste –Chlorobenzene, 1,4-dichlorobenzene, 2,4-dichlorophenol, p-chloroaniline, and ethylbenzene exceeded the TACO SROs, and benzene and tetrachloroethene exceeded 100 times the TACO SROs in subsurface soil and waste at Site P.

Based on the average depth of the bottom of fill material and the surface area exceeding TACO SROs at Site P, the estimated volume of waste and soil that exceeded the TACO SROs at Site P was calculated to be approximately 102,000 cubic yards.

Table 7- Site P: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	16	20	4.3	14,000	1,571	30	3,000
Chlorobenzene	µg/kg	18	20	3.8	5,500	1,248	1,000	100,000
1,4-Dichlorobenzene	µg/kg	9	20	33	160,000	29,915	2000	200,000
2,4-Dichlorophenol	µg/kg	2	20	300	16,000	8,150	1,000	100,000
P-Chloroaniline	µg/kg	5	20	220	15,000	3,462	700	70,000
Ethylbenzene	µg/kg	20	20	1.7	200,000	16,733	13,000	1,300,000
Tetrachloroethene	µg/kg	12	20	11	140,000	12,393	60	6,000

Leaching to Groundwater - At Site P, the analytical results from the RI indicated minimal leaching to the SHU from the waste is occurring. Area conditions include:

- A clay layer beneath the waste material with a minimum thickness of 1.5 feet is present over portions of the site.
- There were no exceedances of TACO GROs in the uppermost groundwater or in the MHU at Site P.
- The shallow groundwater concentrations were two to three orders of magnitude lower than the leachate concentrations.

Groundwater contamination in the DHU originates from upgradient sources (W.G. Krummrich Facility) and extends downgradient of Site P. This contamination in the DHU is migrating under Site P. Groundwater contamination in the shallow aquifer at Site P is significantly lower than groundwater contamination in the deeper aquifer, indicating the DHU contamination did not come from the SHU at Site P.

Vapor - One building with a potentially complete vapor intrusion pathway was identified at Site P. This building, PT's Adult Entertainment, was sampled and evaluated in the Vapor Intrusion HHRA.

Erosion - Site P is located on the east side (dry side) of the levee; therefore, the potential for Site P to be effected by a Mississippi River flood event that could result in the erosion and release of the source material is controlled.

Principal Threat Wastes - NAPL was identified as principal threat waste at two locations within Site P. These two locations included one test trench location (AT-P-4) and one leachate well (LEACH-P-1).

Site Q North

Surface Soil - Minimal surface soil impact was found at Site Q North. Surface soil exceedances of the TACO SROs for benzene and 2,4-dichlorophenol were found in samples from Site Q North in two of fourteen locations. There were no constituent values that exceeded 100 times the TACO SROs in surface soils at Site Q North, as summarized in Table 8.

Table 8- Site Q North: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes

Chemical	Units	No. of Detects	No. of Samples	Min Conc	Max Conc	Avg Conc	IEPA TACO Class I SROs	100X IEPA TACO Class I SROs
Benzene	µg/kg	5	11	0.76	500	101	30	3,000
Chlorobenzene	µg/kg	2	11	0.52	2.4	1.5	1,000	100,000
1,4-Dichlorobenzene	µg/kg	2	11	170	630	400	2000	200,000
2,4-Dichlorophenol	µg/kg	1	11	1,000	1,000	1,000	1,000	100,000
P-Chloroaniline	µg/kg	0	11	--	--	--	700	70,000
Tetrachloroethene	µg/kg	5	11	0.44	11	3.6	60	6,000

Subsurface Soil and Waste – Exceedances of the TACO SROs in the subsurface soil and waste samples were found at Site Q North for chlorobenzene, 1,4-dichlorobenzene, and p-chloroaniline. One location had constituents that exceeded 100 times the TACO SROs for benzene, 2,4-dichlorophenol, 2,4,6-trichlorophenol, and tetrachloroethene. The waste concentrations at Site Q North dogleg were one to two orders of magnitude higher than the remaining southern portion of Site Q North.

Based on the average depth of fill material and the surface area exceedances of the TACO SROs at Site Q North, the estimated volume of soil and waste that exceeded the TACO SROs at Site Q North was calculated to be 161,000 cubic yards.

Table 9- Site Q North: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	18	25	0.76	8,800	579	30	3,000
Chlorobenzene	µg/kg	14	24	1.6	36,000	5,525	1,000	100,000
1,4-Dichlorobenzene	µg/kg	4	25	270	3,200	1,843	2000	200,000
2,4-Dichlorophenol	µg/kg	4	25	30	270,000	84,483	1,000	100,000
P-Chloroaniline	µg/kg	6	25	43	30,000	10,788	700	70,000
2,4,6-Trichlorophenol	µg/kg	2	25	1,400	47,000	24,200	200	20,000
Tetrachloroethene	µg/kg	11	25	0.43	28,000	2,649	60	6,000

Leaching to Groundwater – The groundwater analytical results from the uppermost aquifer at Site Q North indicate that in both the dogleg portion and near the southern boundary of Site R, leaching to the SHU from the waste was occurring; however, minimal leaching is occurring in the southern portion of the site. The waste concentrations at Site Q North dogleg were one to four orders of magnitude higher than in the remaining southern portion of Site Q North. In addition, the regional groundwater flow and transport model indicate that the plumes in the SHU, MHU, and DHU under Site Q North are captured by the GMCS.

Vapor – Four buildings with potentially complete vapor intrusion pathways were identified at Site Q North. These four locations were the River City Landscape Supply (RCSL) warehouse, Eagle Marine Industries (EMI) office trailer, ConAgra maintenance building, and the ConAgra warehouse. All four locations were sampled and evaluated in the Vapor Intrusion HHRA.

Erosion – Site Q (Site Q North, Q Central, and Q South) is covered with crushed gravel and asphalt, which minimizes the impact of erosion due to surface run-off. Approximately 2,580 feet of the Mississippi River bank adjacent to Site Q is protected by riprap armor. The riprap cover on the southern most portion approximately 470 feet of the Mississippi River bank adjacent to Site Q thins-out and is less dense. At the southern end of Site Q Central, at the barge construction area, approximately 360 feet of the Mississippi River bank is covered in approximately 3.5 feet of compacted rock.

The Mississippi River has flooded a portion of Site Q several times during recent years, reportedly causing scouring and erosion at parts of the site, and ultimately leading to EPA Removal Actions (Ecology & Environment, 1995; Ecology & Environment, 2000). Site Q has flooded recently in 1977, 1987, 1993, and 1995 (EPA, December 1998).

Improvements since the last flood include buildings, parking lots, and, approximately 2,580 feet of bank riprap. This history suggests that future erosion due to flooding is possible. The 2011 flood study concluded that during a 100-year flood event maximum velocities calculated did not exceed 2 feet per second. Areas of potential concern during the 100-year flooding event include the fringes of a small sand stockpile in Site Q Central and the alluvial silts in the ephemeral ponds in Site Q South.

Principal Threat Wastes - NAPL was identified as principal threat waste at four locations within Site Q North. NAPL from Site Q North is captured and treated by the GMCS.

Site Q Central

Surface Soil – The surface material at Site Q Central generally consists of crushed rock, mulch, and black cinders averaging approximately 1.4 feet in thickness. There were no surface soil constituents that exceeded the TACO SROs at Site Q Central, as summarized in Table 10 below.

Table 10- Site Q Central: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes

Chemical	Units	No. of Detects	No. of Samples	Min Conc	Max Conc	Avg Conc	IEPA TACO Class I SROs	100X IEPA TACO Class I SROs
Benzene	µg/kg	10	19	0.93	12	3.0	30	3,000
Chlorobenzene	µg/kg	5	19	1.3	220	53	1,000	100,000
1,4-Dichlorobenzene	µg/kg	3	19	45	320	168	2000	200,000
2,4-Dichlorophenol	µg/kg	0	19	--	--	--	1,000	100,000
P-Chloroaniline	µg/kg	0	19	--	--	--	700	70,000
Ethylbenzene	µg/kg	5	11	0.19	740	149	13,000	1,300,000

Subsurface Soil and Waste - A total of 20 trenches were excavated and 15 soil borings were advanced (of which six were converted to monitoring wells) at Site Q Central. Municipal waste and debris was encountered at these sample locations and found throughout the site. Industrial waste and impacted soil was also identified. In seven of twenty locations in Site Q Central subsurface soil and waste exceeded the TACO SROs for benzene, 1,4-dichlorobenzene, p-chloroaniline, and ethylbenzene, as summarized in Table 11. One location exceeded 100 times the TACO SROs for chlorobenzene. The estimated volume of soil and waste that exceeded the TACO SROs in Site Q Central is 296,000 cubic yards.

Table 11- Site Q Central: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	15	25	1.1	1,300	143	30	3,000
Chlorobenzene	µg/kg	15	26	7.6	240,000	21,333	1,000	100,000
1,4-Dichlorobenzene	µg/kg	11	26	100	24,000	3,455	2000	200,000
2,4-Dichlorophenol	µg/kg	1	25	400	400	400	1,000	100,000
P-Chloroaniline	µg/kg	1	25	1,100	1,100	1,100	700	70,000
Ethylbenzene	µg/kg	13	25	1.2	130,000	11,138	13,000	1,300,000

Leaching to Groundwater – RI results indicate minimal leaching of waste contaminants to the SHU is occurring. However, two locations within the southwestern portion of Site Q Central had detections above the TACO GROs for benzene, chlorobenzene, and p-chloroaniline.

Two groundwater plumes are present in the aquifer under Sites Q Central, which reach the Mississippi River at low level concentrations. These plumes are not captured by the GMCS.

Vapor – Five buildings with potentially complete vapor intrusion pathways were identified at Site Q Central. These buildings were sampled and evaluated in the Vapor Intrusion HHRA.

Erosion –See the above Site Q North erosion discussion about erosion at Site Q.

Principal Threat Wastes – No principal threat waste was observed at Site Q Central, as documented in the Principal Threat Wastes Technical Memorandum (URS, 2008b).

Site Q South

Surface Soil – Only tetrachloroethene exceeded the TACO SRO at Site Q South in surface soil. No indicator constituents exceeded 100 times the TACO SROs at Site Q South.

Table 12- Site Q South: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	13	24	1.1	10	3.6	30	3,000
Chlorobenzene	µg/kg	7	24	0.36	45	8.8	1,000	100,000
1,4-Dichlorobenzene	µg/kg	2	24	82	430	256	2000	200,000
2,4-Dichlorophenol	µg/kg	0	24	--	--	--	1,000	100,000
P-Chloroaniline	µg/kg	1	24	330	330	330	700	70,000
Tetrachloroethene	µg/kg	9	24	0.6	1,700	211	60	6,000

Subsurface Soil and Waste - Benzene and chlorobenzene were above TACO SROs at Site Q South, and tetrachloroethene and toluene were above 100 times the TACO SROs at Site Q South. The estimated volume of soil and waste that exceeded the TACO SROs at Site Q South is 60,000 cubic yards.

Table 13- Site Q South: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	15	21	0.62	2,000	184	30	3,000
Chlorobenzene	µg/kg	9	21	0.58	3,500	655	1,000	100,000
1,4-Dichlorobenzene	µg/kg	4	21	52	1,200	375	2000	200,000
2,4-Dichlorophenol	µg/kg	1	21	100	100	100	1,000	100,000
P-Chloroaniline	µg/kg	1	21	160	160	160	700	70,000
Tetrachloroethene	µg/kg	9	24	0.76	8,800	624	60	6,000
Toluene	µg/kg	14	21	2	1,300,000	92,912	12,000	1,200,000

Leaching to Groundwater – The RI results indicate that leaching is occurring from Site Q South to the SHU. At two locations in uppermost groundwater within Site Q South contaminant concentrations were found above TACO GROs.

A contaminated groundwater plume is present in both the MHU and the DHU at Site Q South. This plume originates from Site Q South near the boundary with Site Q Central and extends to locations in the southwestern portion of the Site Q Central. This plume reaches the Mississippi River at low level concentrations. NAPL was not identified at Site Q South; however, intact drums were identified in test trench locations.

Vapor - No buildings with potentially complete vapor intrusion pathways were identified at Site Q South.

Erosion - See the above Site Q North erosion discussion about erosion at Site Q. Additionally, the majority of the site is covered with thick vegetation, which minimizes the impact of erosion due to surface run-off.

Principal Threat Wastes - The presence of NAPL and buried drums was evaluated at Site Q South to assess the presence of principal threat wastes. Two intact drums were found near AT-Q-35 in Site Q South and potential NAPL leaked into the trench from one of the drums. Since the drums were found in close proximity to each other, both were considered to contain liquid and be principal threat waste. Three step-out trenches from AT-Q 35 were then excavated. Two step-out trenches to the west of AT-Q-35 at distances of 50 (TT-Q-35-W-1) and 100 (TT-Q-35-W-2) feet uncovered no intact drums, but did uncover metal drum remnants and fragments and industrial waste in TT-Q-35-W-1. The step-out process was continued. No metal drums or drum fragments or industrial waste were observed in TT-Q-35-W-2; therefore, further step-out trenches to the west were not excavated. One step-out trench was excavated to the north of AT-Q-35 at a distance of 50 (TTQ-35-N-1) feet. Approximately four metal drum remnants and fragments were observed in TT-Q-35-N-1 and no intact metal drums were found. The density of drum remnants was not as significant as AT-Q-35; therefore, further step-out trenches to the north were not excavated. Based on these observations, the area estimated to contain principal threat drummed waste at AT-Q-35 is approximately 100 square feet.

Site Q South Ponds

Sediments – There were no detections of the five indicator constituents in the pond sediments during the RI samplings.
Surface Water – Low concentrations of benzene were present in the surface water samples collected from the Site Q South Ponds. There were no detections of chlorobenzene, 1,4—dichlorobenzene, 2,4-dichlorophenol, and p-chloroaniline.

Site R

Surface Soil - 1,4-dichlorobenzene and p-chloroaniline were found above the TACO SROs at Site R. Benzene, chlorobenzene, 2,4-dichlorophenol, 2,4-D, 2,4,6-trichlorophenol, and nitrobenzene were found above 100 times the TACO SROs. Based on these analytical results the entire site was assumed to exceed the TACO SROs.

Table 14- Site R: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	4	4	0.68	2.1	1.4	30	3,000
Chlorobenzene	µg/kg	3	4	1.8	64	23	1,000	100,000
1,4-Dichlorobenzene	µg/kg	0	4	--	--	--	2000	200,000
2,4-Dichlorophenol	µg/kg	0	4	--	--	--	1,000	100,000
P-Chloroaniline	µg/kg	0	4	--	--	--	700	70,000
2,4 -D	µg/kg	1	4	55	55	55	1,500	150,000

Subsurface Soil and Waste - 1,4-dichlorobenzene and p-chloroaniline were found above the TACO SROs at Site R. Benzene, chlorobenzene, 2,4-dichlorophenol, 2,4-D, 2,4,6-trichlorophenol, and nitrobenzene were found above 100 times the TACO SROs.

Table 15- Site R: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	8	8	1.6	150,000	39,279	30	3,000
Chlorobenzene	µg/kg	8	8	1.4	2,400,000	349,757	1,000	100,000
1,4-Dichlorobenzene	µg/kg	3	8	580	24,000	8,727	2000	200,000
2,4-Dichlorophenol	µg/kg	6	8	30	3,500,000	654,720	1,000	100,000
P-Chloroaniline	µg/kg	6	8	49	36,000	14,255	700	70,000
2,4,6-Trichlorophenol	µg/kg	5	8	100	650,000	176,020	200	20,000
2,4 -D	µg/kg	7	8	270	580,000	115,824	1,500	150,000
Nitrobenzene	µg/kg	3	8	1,100	48,000	25,367	100	10,000

Leaching to Groundwater – The conceptual site model for contaminant fate and transport for Site R was based on site history, source material, and migration pathways. The groundwater under Site R is impacted throughout the vertical extent of the aquifer from both on-site and off-site sources. Analytical data indicates that waste from Site R is leaching into the shallow aquifer. The contaminated groundwater under Site R moves to the west, combines with the other upgradient sources (e.g., Sauget Area 1 and 2 sites, former Clayton facility and Krummrich plant), and is intercepted by the GMCS downgradient of Site R. As stated in the regional groundwater model, when all modeled constituents were included, over 94% of the total plume mass flux (mass discharge rate) is predicted to be captured and treated by the GMCS/ABRTF. For Sauget Area 2 sources only, when all modeled constituents are included, 98% of the total plume mass flux is predicted to be captured and treated by the GMCS/ABRFT.

Vapor - No buildings with potentially complete vapor intrusion pathways were identified at Site R.

Erosion –The 2011 flood study concluded that during a 100-year flood event maximum velocities calculated did not exceed 2 feet per second. The majority of Site R was above the water surface profile for the 100-year flooding event.

Principal Threat Wastes - NAPL was identified as principal threat waste at eight soil boring locations in Site R. The NAPL observed in Site R is considered a principal threat waste; however, these locations are already captured and treated by the GMCS/ABRTF. In addition, materials present in Site R leachate (LEACH-R-1) pose a potential risk in excess of EPA's principal threat waste threshold risk level of 1×10^{-3} and, therefore, is identified as principal threat wastes.

Site S

Surface Soil -1,4-dichlorobenzene and 2,4-dichlorophenol were found above the TACO SROs in surface soil at Site S. No constituents exceeded 100 times TACO SROs.

Table 16- Site S: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes

Chemical	Units	No. of Detects	No. of Samples	Min Conc	Max Conc	Avg Conc	IEPA TACO Class I SROs	100X IEPA TACO Class I SROs
Benzene	µg/kg	2	4	1.4	1.5	1.5	30	3,000
Chlorobenzene	µg/kg	1	4	0.47	0.47	0.47	1,000	100,000
1,4-Dichlorobenzene	µg/kg	1	4	7,500	7,500	7,500	2000	200,000
2,4-Dichlorophenol	µg/kg	1	4	2,300	2,300	2,300	1,000	100,000

Table 16- Site S: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Surface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
P-Chloroaniline	µg/kg	0	4	--	--	--	700	70,000
1,1,1-Trichloroethane	µg/kg	1	4	6.6	6.6	6.6	2,000	200,000
Tetrachloroethene	µg/kg	3	4	0.83	3	2.1	60	6,000
Toluene	µg/kg	2	4	6.2	30	18	12,000	1,200,000

Subsurface Soil and Waste- Contaminant concentrations in subsurface soil and waste samples were found above TACO SROs in all four Site S locations. Benzene, chlorobenzene, 1,4-dichlorobenzene, p-chloroaniline, 1,1,1-trichloroethane, dichloromethane, tetrachloroethene, toluene, and trichloroethene were found above 100 times SROs. The estimated volume of soil and waste that exceeded the TACO SROs at Site S was calculated to be 8,000 cubic yards.

Table 17- Site S: Maximum, Minimum and Mean Concentrations of Indicator Constituents in Subsurface Soil and Wastes								
Chemical	**Units**	**No. of Detects**	**No. of Samples**	**Min Conc**	**Max Conc**	**Avg Conc**	**IEPA TACO Class I SROs**	**100X IEPA TACO Class I SROs**
Benzene	µg/kg	3	7	2,400	35,000	23,800	30	3,000
Chlorobenzene	µg/kg	3	7	190	1,200,000	530,063	1,000	100,000
1,4-Dichlorobenzene	µg/kg	2	7	4,500	200,000	102,250	2000	200,000
2,4-Dichlorophenol	µg/kg	0	7	--	--	--	1,000	100,000
P-Chloroaniline	µg/kg	2	7	7,600	70,000	38,800	700	70,000
1,1,1-Trichloroethane	µg/kg	7	7	45	220,000	43,792	2,000	200,000
Dichloromethane	µg/kg	5	7	2,100	57,000	20,140	20	2,000

Leaching to Groundwater –While the soil and waste concentrations in Site S exceeded 100 times the TACO SROs at all locations, analytical results from the uppermost groundwater indicate leaching from the waste to the SHU is minimal based on:

- The surface soil at Site S consists of a low permeability silty-clay fill layer with a minimum thickness of one foot, which was present underlying most of the observed waste or shallow subsurface material at Site S.
- Only benzene is found above the TACO groundwater remediation objectives (GROs) in groundwater downgradient of Site S.
- The SHU and DHU plumes beneath Site S originate from an upgradient location and extend downgradient of Site S. Groundwater contaminant concentrations upgradient of Site S are higher in the SHU than downgradient concentrations. Groundwater impacts beneath and downgradient of Site S are found deep in the aquifer, with the concentrations in the shallow depths significantly lower or not detected.

Based on these observations, Site S soil and waste is not a significant on-going source contamination to the underlying aquifer. This is primarily due to the silty-clay layer observed beneath the waste material observed under most of Site S. Additionally, based on the regional groundwater flow and transport model, the plumes in the MHU and DHU under Site S are captured by the GMCS.

Vapor - No buildings with potentially complete vapor intrusion pathways were identified at Site S. However, the American Bottoms Laboratory building is located approximately 175 feet east of Site S, and the Veolia hazardous waste storage buildings are located approximately 50 feet west of Site S. Therefore, these buildings were evaluated in the Vapor Intrusion HHRA.

Erosion - Site S is located on the east side (dry side) of the levee; therefore, the potential for Site S to be effected by a flood event that could result in the erosion and release of the source material is minimal. Additionally, all of the waste at Site S is covered, thereby reducing the risk of erosion caused by surface run-off.

Principal Threat Waste - No principal threat waste was observed at Site S, as documented in the Principal Threat Wastes Technical Memorandum (URS, 2008b).

Summary of Extent of Contamination

The contaminant source areas at Sauget Area 2 are the disposal areas at Sites O, O North, O South, P, Q North, Q Central, Q South, Q South Ponds, R, and S. Principal threat waste was observed at Site P, Q North, Q South, and R. At Site P, NAPL was observed in Trench AT-P-4 and well LEACH P-1. At Site Q North, NAPL was observed at Sonic-5 and well LEACH-Q-1. At Site Q South, two intact drums were found from which NAPL may have leaked into the trench. At Site R, NAPL was observed at eight locations. The NAPL identified on Site Q North and Site R are captured and treated by the GMCS/ABRTF.

2.6 – Current and Potential Future Site and Resource Uses

The Sauget Area 2 Site has been used for industrial purposes for many years (since the 1930's or earlier). The sites within Sauget Area 2 are zoned commercial/industrial and it is likely that the sites will continue to be used well into the reasonably foreseeable future for commercial/industrial purposes.

Historically, groundwater from the American Bottoms aquifer was a major source of water for the area and was used for industrial, public, and irrigation purposes. Groundwater levels prior to industrial and urban development were near land surface. Intensive industrial groundwater withdrawal and use, and construction of a system of drainage ditches, levees, and canals to protect developed areas, lowered the groundwater elevation for many years. However, by the mid-1980s, the groundwater levels increased due to reduced pumpage, high river stages, and high precipitation.

Currently, no groundwater is being pumped from the American Bottoms aquifer in the vicinity of Sauget Area 2 for public, private, or industrial supply purposes. Groundwater is not a source of drinking water in the area. The Villages of Sauget and Cahokia have issued ordinances prohibiting the use of groundwater as a potable water source. These ordinances were issued in response to historic industrial use in the region and resulting groundwater quality impairments. Groundwater use restrictions will likely remain in place for the foreseeable future due to the extent of the groundwater quality impairments.

2.7 - Summary of Site Risks

2.7.1 - Summary of Human Health Risk Assessment

A human health risk assessment (HHRA) estimates what potential risks a site poses to human health if no action is taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the HHRA for the Sauget Area 2 Site. Two HHRAs were conducted by the PRPs, with EPA oversight, the Site-wide HHRA (2009) and Vapor Intrusion HHRA (2009). The PRPs completed these Site-specific risk assessments to quantify the potential threat to public health from actual or threatened releases of hazardous substances into the environment. The HHRAs were prepared using EPA's Risk Assessment Guidance for Superfund (RAGS) and evaluated potential current and future exposure scenarios at the Site.

The objectives of the risk evaluation using the HHRA were : (1) to evaluate whether Site-related constituents detected in environmental media pose risks above EPA-acceptable levels for current and future human receptors, and (2) to support decisions concerning the need for further evaluation or action, based upon current and reasonably anticipated future land use. Future land uses were assumed to be the same as current land uses. Current land uses are commercial/industrial and the Sites will likely continue to be used well into the reasonable foreseeable future for commercial/industrial purposes. Therefore, the Sites were evaluated for non-residential use scenarios. Receptors were identified for the Sites based on the CSM for

human health and the COPCs identified in media at each site. The potential receptor groups considered included:

- Sites (O, P, Q , R and S)
  - Future indoor industrial worker
  - Future outdoor industrial workers
  - Future construction/ utility workers
  - Future trespassing teenagers
- Site Q South Ponds
  - Current and future trespassing teenager
  - Current and future recreational anglers

Two general types of health risk were characterized for each potential exposure pathway: potential carcinogenic risk (risk) and potential non-carcinogenic hazard (hazard). Risks and hazards were calculated using standard risk assessment methodologies. Risks were compared to EPA's acceptable risk range: from $1x10^{-6}$ (one excess cancer per one million exposed receptors) to $1x10^{-4}$ (one excess cancer per ten thousand exposed receptors). Risks less than $1x10^{-6}$ are considered insignificant. Risks within the above range are remediated at the discretion of EPA risk managers. Risks greater than $1x10^{-4}$ typically require remediation. Non-carcinogenic hazards are compared to a target hazard index (HI) of 1. The potential risks from the individual contaminants and exposure pathways are added up to calculate total Site risk.

The following provides a brief description of the various HHRAs conducted in the Sauget Area 1 Site:

- **Site-Wide HHRA**: PRPs conducted a Site-wide HHRA for the Sauget Area 2 Sites (HHRA, AECOM, 2009).
- **Vapor Intrusion HHRA**: PRPs conducted a Vapor Intrusion HHRA for the Sauget Area 2 Sites (VI HHRA, AECOM, 2008).

To guide identification of appropriate exposure pathways for the risk assessments, the PRPs, with EPA oversight, developed a CSM for human health (Figure 2) which presents source areas, potential migration pathways of contaminants from source areas to environmental media where exposure can occur, and potential human receptors. The CSM for human health was discussed in Section 2.5.1.

The CSM links contaminant concentrations in various media to potential human exposure and identified the following exposure scenarios for each site:

- Sites (O, P, Q , R and S)
  - Future indoor industrial worker - Potential exposure to COPCs via inhalation of volatile constituents present in indoor air due to vapor intrusion from the subsurface.
  - Future outdoor industrial workers - Potential exposure to COPCs in surface soil via: (1) incidental ingestion and dermal contact, (2) inhalation of non-volatile COPCs that may be suspended as dusts from surface soils, and (3) inhalation of COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste).

- Future construction/ utility workers - Potential exposure to COPCs in soils (combined surface soil, subsurface soil, waste) via: (1) incidental ingestion and dermal contact, (2) inhalation of volatile emissions and particulates suspended during excavation activity, (3) incidental ingestions and dermal contact with COPCs in shallow groundwater and leachate, and (4) inhalation of COPCs volatilized from standing water in an excavation trench.
- Future trespassing teenagers - Potential exposure to COPCs in surface soils via: (1) incidental ingestion and dermal contact, (2) inhalation of non-volatile COPCs that may be suspended as dusts from surface soils, and (3) inhalation to COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste).

- Site Q Ponds
  - Current and future trespassing teenager - Potential exposure to COPCs in surface water and sediment from the Site Q Ponds.
  - Current and future recreational anglers - Potential exposure to COPCs in surface water, sediment, and fish fillet from the Site Q Ponds.

Assumptions about exposure frequency, duration, and other exposure factors are discussed in more detail in the HHRAs.

2.7.2 - Data Quality and Usability

Data were evaluated based on completeness, holding times, initial and continuing calibrations, surrogate recoveries, internal standards, compound identification, laboratory and field quality assurance/quality control (QA/QC) procedures and results, reporting limits, documentation practices, and application of validation qualifiers. Analytical data collected during the RI and SI were considered to be acceptable for use in the HHRAs.

2.7.3 - Identification of Contaminants of Concern

For potentially carcinogenic risk results, COCs are identified as those COPCs that result in target risk above $1x10^{-4}$. For noncarcinogenic hazard results, COCs are identified as those COPCs that result in toxic-endpoint specific HI greater than 1.

Tables 18 through 26 present the contaminants of concern (COCs) that pose potential threats to human health in the specified media for Sites O, P, Q, R, and S. The tables also identify the exposure point concentrations (EPCs), the concentration ranges, the detection frequency, and how the EPCs were derived. An EPC is an estimate of the true arithmetic mean concentration of a chemical in a medium at an exposure point and is discussed in Section 2.7.5.

2.7.4 - Exposure Assessment

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPCs retained for quantitative evaluation in the HHRA. The

first step in the exposure assessment is the characterization of the site setting and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios identifying appropriate environmental media and exposure pathways for current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPCs are identified and are judged to be complete are evaluated quantitatively in the risk assessment. The exposure pathways and receptors considered for evaluation at the Sauget Area 2 Site, along with the rationale for their inclusion in, or exclusion from, the quantitative risk assessment are described in the HHRAs.

Sauget Area 2 Sites have been used for industrial purposes for many years and use of these areas is expected to remain industrial. Therefore, the sites were evaluated for commercial/industrial use scenarios in the Site-wide HHRA (AECOM, 2009).

2.7.5 - Exposure Point Concentrations

Exposure points are located where potential receptors may contact COCs at or from the Site. The concentration of COCs in the environmental medium that receptors contact is called the Exposure Point Concentration (EPC) and is estimated. Both measured and modeled EPCs scenarios were developed. The approaches used to calculate EPCs under the two scenarios are presented in the HHRA. EPCs were calculated following the methods and recommendations provided in EPA's risk assessment guidance. A summary of the EPCs for COCs for the sites is provided in Tables 18 through 26.

Table 18 – Summary of Contaminants of Concern for Site O

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection (2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Surface Soil	Dioxin TEQ-HH	6.37E-5	6.77E-3	2:2:2	6.77E-3	Max
Combined Soil	PCBs, Total	5.32E-2	2.98E+2	9:11:11	1.63E+2	95% UCL

(1) Soil units – mg/kg
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Max – Maximum Detected Concentration
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration
PCB - Polychlorinated Biphenyls
95% UCL – 95% Upper Confidence Limit

Table 19 – Summary of Contaminants of Concern for Site O North

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection (2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Surface Soil	Dioxin TEQ-HH	5.15E-2	5.15E-2	1:1:1	5.15E-2	Max
	PCBs, Total	7.09E+2	7.09E+2	1:1:1	7.09E+2	Max
Combined Soil	Dioxin TEQ-HH	5.15E-2	6.08E-1	5:5:5	6.08E-1	Max
	PCBs, Total	5.98E-2	3.05E+3	6:6:6	3.05E+3	Max
Leachate	PCBs, Total	5.49E-2	5.49E-2	1:1:1	5.49E-2	Max

(1) Soil units – mg/kg; Leachate units – mg/L
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Max – Maximum Detected Concentration
PCB - Polychlorinated Biphenyls
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration

Table 20 – Summary of Contaminants of Concern for Site P

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection (2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Combined Soil	PCBs, Total	5.19E-2	4.03E+2	16:20:20	1.22E+2	95% UCL

(1) Soil units – mg/kg
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
PCB - Polychlorinated Biphenyls
95% UCL – 95% Upper Confidence Limit

Table 21 – Summary of Contaminants of Concern for Site Q North

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection(2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Combined Soil	Dioxin TEQ-HH	5.88E-5	6.78E-2	15:17:17	4.59E-2	95% UCL
	PCBs, Total	4.51E-1	2.21E+2	17:22:22	1.49E+2	95% UCL
	Lead	7.60E+0	2.40E+4	28:29:29	1.16E+3	Average
Leachate	2,4-DCP	9.80E+1	1.80E+2	5:5:5	1.80E+2	Max
	Lead	4.15E-1	2.80E+0	2:5:5	1.61E+0	Average
	PCP	5.00E-1	6.30E+0	4:5:5	6.30E+0	Max
	PCBs, Total	1.25E-3	4.79E-2	4:4:4	4.79E-2	Max

(1) Soil units – mg/kg
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Max – Maximum Detected Concentration
PCB - Polychlorinated Biphenyls
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration
95% UCL – 95% Upper Confidence Limit
2,4-DCP - 2,4-Dichlorophenol
PCP - Pentachlorophenol

Table 22 – Summary of Contaminants of Concern for Site Q Central

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection(2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Surface Soil	Dioxin TEQ-HH	5.78E-5	3.87E-3	10:14:14	2.09E-3	95% UCL

(1) Soil units – mg/kg
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration
95% UCL – 95% Upper Confidence Limit

Table 23 – Summary of Contaminants of Concern for Site Q South

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection(2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Surface Soil	Dioxin TEQ-HH	5.27E-5	7.11E-3	22:22:22	3.70E-3	95% UCL
	Cadmium	4.10E-1	8.00E+3	24:24:24	3.65E+3	95% UCL
Combined Soil	Cadmium	1.30E-1	8.00E+3	43:45:45	2.46E+3	95% UCL

(1) Soil units – mg/kg
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration
95% UCL – 95% Upper Confidence Limit

Table 24 – Summary of Contaminants of Concern for Site Q South Ponds

Exposure Point	COC	Concentration Detected (1)		Frequency of Detection(2)	Exposure Point Concentration	Statistical Measure
		Min	Max			
Large Pond Fish	**Black Bullhead**					
	Dieldrin	1.00E-1	1.00E-1	1:1:1	1.00E-1	Max
	PCBs, Total	3.87E+0	3.87E+0	1:1:1	3.87E+0	Max
	Carp					
	Arsenic	8.20E-1	8.20E-1	1:1:1	8.20E-1	Max
	Benzo(a)pyrene	1.80E-1	1.80E-1	1:1:1	1.80E-1	Max
	Dieldrin	1.90E-1	1.90E-1	1:1:1	1.90E-1	Max
	Dioxin TEQ-HH	1.53E-5	1.53E-5	1:1:1	1.53E-5	Max
	PCBs, Total	1.00E+1	1.00E+1	1:1:1	1.00E+1	Max
Small Pond Surface Water	Benzo(a)pyrene	1.50E-3	4.60E-3	2:3:3	4.60E-3	Max

(1) Fish units – mg/kg; Surface water units – mg/L
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Max – Maximum Detected Concentration
PCB - Polychlorinated Biphenyls
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration

Table 25 – Summary of Contaminants of Concern for Site R

Exposure Point	COC	Concentration Detected [1]		Frequency of Detection [2]	Exposure Point Concentration	Statistical Measure
		Min	Max			
Combined Soil	Tetrachloroethene	2.60E-3	1.20E+3	10:12:12	7.64E+2	95% UCL
	PCBs, Total	7.91E-2	2.78E+2	8:12:12	9.53E+1	95% UCL
Leachate	Benzene	5.90E+0	1.47E+3	4 : 4 : 4	1.47E+3	Max
	Benzo(a)pyrene	1.80E-1	1.80E-1	1 : 4 : 4	1.80E-1	Max
	Benzo(b)fluoranthene	1.42E+1	1.42E+1	1 : 4 : 4	1.42E+1	Max
	Benzo(k)fluoranthene	2.00E-1	1.41E+1	2 : 4 : 4	1.41E+1	Max
	Chlorobenzene	1.10E+0	1.03E+3	4 : 4 : 4	1.03E+3	Max
	Chloroform	2.00E+0	3.07E+2	4 : 4 : 4	3.07E+2	Max
	Chloromethane	1.51E+2	1.51E+2	1 : 4 : 4	1.51E+2	Max
	Dibenzo(a,h)anthracene	1.90E-1	1.90E-1	1 : 4 : 4	1.90E-1	Max
	Dioxin TEQ-HH	1.53E-8	2.81E-6	3 : 4 : 4	2.81E-6	Max
	1,2,4-Trichlorobenzene	2.77E+1	2.77E+1	1 : 4 : 4	2.77E+1	Max
	1,2-Dichloroethane	4.70E+1	1.97E+3	4 : 4 : 4	1.97E+3	Max
	1,2-Dichloroethene (total)	1.30E+1	1.20E+3	4 : 4 : 4	1.20E+3	Max
	1,4-Dichlorobenzene	7.60E+0	3.77E+1	2 : 4 : 4	3.77E+1	Max
	2-Methylnaphthalene	8.20E-1	1.62E+1	2 : 4 : 4	1.62E+1	Max
	2,4-Dichlorophenol	5.20E-1	2.43E+1	3 : 4 : 4	2.43E+1	Max
	4-Chloroanaline	2.00E+1	5.39E+2	4 : 4 : 4	5.39E+2	Max
	4,4'-DDT	2.10E-1	8.20E-1	2 : 4 : 4	8.20E-1	Max
	Manganese	9.20E+1	2.50E+2	4 : 4 : 4	2.50E+2	Max
	MCPA	1.09E+3	1.09E+3	1 : 4 : 4	1.09E+3	Max
	Naphthalene	5.60E+0	5.60E+0	1 : 4 : 4	5.60E+0	Max
	PCBs, Total	4.06E+0	1.75E+2	4 : 4 : 4	1.75E+2	Max
	Tetrachloroethene	1.80E+1	6.87E+4	4 : 4 : 4	6.87E+4	Max
	Trichloroethene	1.00E+2	7.97E+4	4 : 4 : 4	7.97E+4	Max
	Toluene	1.60E+1	1.73E+4	4 : 4 : 4	1.73E+4	Max
	Xylenes, Total	4.70E-1	1.07E+3	3 : 4 : 4	1.07E+3	Max

(1) Soil units – mg/kg; Leachate units – mg/L

(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Max – Maximum Detected Concentration
PCB - Polychlorinated Biphenyls
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration
95% UCL – 95% Upper Confidence Limit
MCPA - 2-methyl-4-chlorophenoxyacetic acid

Table 26 – Summary of Contaminants of Concern for Site S						
Exposure Point	**COC**	**Concentration Detected (1)**		**Frequency of Detection(2)**	**Exposure Point Concentration**	**Statistical Measure**
		Min	**Max**			
Surface Soil	PCBs, Total	1.38E-1	1.01E+3	2:2:2	1.01E+3	Max
Combined Soil	PCBs, Total	1.38E-1	1.01E+3	7:8:8	1.01E+3	Max

(1) Soil units – mg/kg
(2) FOD - Number of samples detected: Number of valid results (i.e., not rejected): Total number of samples.

COC – Contaminant of Concern
Max – Maximum Detected Concentration
PCB - Polychlorinated Biphenyls

2.7.6 - Toxicity Assessment

The toxicity assessment provides a description of the relationship between a dose of a chemical and the potential likelihood of an adverse health effect. The purpose of the toxicity assessment is to provide a quantitative estimate of the inherent toxicity of COCs for use in risk characterization. Potential health risks for COCs are evaluated for both carcinogenic and non-carcinogenic risks.

The purpose of the toxicity assessment is to assign toxicity values (criteria) to each contaminant evaluated in the risk assessment. The toxicity values are used in conjunction with the estimated doses to which a human could be exposed to evaluate the potential human health risk associated with each contaminant. In evaluating potential health risks, both carcinogenic and non-carcinogenic health effects were considered.

Cancer slope factors (CSFs) are developed by the EPA under the assumption that the risk of cancer from a given chemical is linearly related to dose. CSFs are developed from laboratory animal studies or human epidemiology studies and classified according to route of administration. The CSF is expressed as $(mg/kg/day)^{-1}$ and when multiplied by the lifetime average daily dose expressed as mg/kg/day will provide an estimate of the probability that the dose will cause cancer during the lifetime of the exposed individual. Cancer toxicity data for the COCs are summarized in Appendix D, Table 1.

The toxicity criteria used to evaluate potential non-carcinogenic health effects are reference doses (RfDs). The RfD is expressed as mg/kg/day and represents that dose that has been determined by experimental animal tests or by human observation to not cause adverse health effects, even if the dose is continued for a lifetime. The procedure used to estimate this dose incorporates safety or uncertainty factors that assume it will not over-estimate this safe dose. Non-cancer toxicity data for the COCs are summarized in Appendix D, Table 2.

2.7.7 - Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

Where:

risk = a unit less probability (e.g., 2×10^{-5}) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that are expressed typically in scientific notation (e.g., 1×10^{-6}). An excess lifetime risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure (RME) estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as excess lifetime cancer risk because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance an individual developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally-acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., a lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any adverse effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all COCs to which a given individual may reasonably be exposed that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media. An HI of 1 or less indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health. When the total site HI is greater than 1 for any receptor, a more detailed evaluation of potential non-carcinogenic effects based on specific health or target endpoints (e.g., liver effects, neurotoxicity) is performed (EPA, 1989a).

The HQ is calculated as follows:

$$\text{Non-cancer HQ} = \text{CDI/RfD}$$

Where:

CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

Tables 27 through Table 40 provide a summary of the potential carcinogenic and non-carcinogenic risks from each site's COCs and potential receptors. Further risk summary details are included for each site in Appendix D. HIs that are greater than one on a total basis, but are below one on a target organ basis are not highlighted in the risk summary tables.

Site O

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. Carcinogenic risks greater than $1x10^{-4}$ are highlighted. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 27: Site O - Total Potential Risk and Hazard Index

Receptor	Cancer	Non-Cancer
Indoor Industrial Worker	2.0E-08	3.7E-04
Outdoor Industrial Worker	3.2E-04	7.4E+00
Construction/Utility Worker	4.0E-05	3.1E+00
Trespassing Teenager	2.5E-05	1.0E+00

Site O is located in an isolated area and is not currently used. Currently, the former ABRTF lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the risks presented above for workers represent a potential future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration).

Site O North

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. Carcinogenic risks greater than $1x10^{-4}$ are highlighted. HIs are highlighted where the total is greater than one on a target organ basis.

Table 28: Site O North- Total Potential Risk and Hazard Index

Receptor	Cancer	Non-Cancer
Outdoor Industrial Worker	2.2E-03	7.5E+01
Construction/Utility Worker	4.9E-04	4.8E+01
Trespassing Teenager	1.9E-04	1.0E+01

Site O North is located in an isolated area and is not currently used. The former ABRTF lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the risks presented above for construction/utility workers represent a potential future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration).

Site O South

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below.

Table 29: Site O South- Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Outdoor Industrial Worker	NCOPC	NCOPC
Construction/Utility Worker	2.3E-08	4.5E-04
Trespassing Teenager	NCOPC	NCOPC

The risks noted above are below the target risk level of $1x10^{-4}$, and the HIs are below one. Because there were no target risk levels above acceptable levels, no COCs are identified.

Site P

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. The carcinogenic risks were less than the target risk level of $1x10^{-4}$. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 30: Site P-Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Indoor Industrial Worker	2.0E-05	9.9E-01
Outdoor Industrial Worker	7.2E-05	1.4E+00
Construction/Utility Worker	7.0E-06	1.9E+00
Trespassing Teenager	2.7E-06	1.2E-01

Site P is currently inactive and in large part covered, and access to the site is unrestricted. A nightclub and asphalt parking lot occupy three acres in the southeast corner of the site. The risks presented above for construction/utility workers represent a potential future scenario. Although risks and hazards are acceptable for the indoor industrial worker, vapor intrusion sampling and subsequent risk analysis could not rule out a potential for risk due to exposure to vapors inside the on-site nightclub.

Site Q North

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. Carcinogenic risks were less than $1x10^{-4}$. HIs are highlighted where the total is greater than one on a target organ basis.

Table 31: Site Q North – Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Indoor Industrial Worker	4E-6	6.4E-1
Outdoor Industrial Worker	7.8E-05	1.4E+00
Construction/Utility Worker	8.5E-05	1.1E+01

Table 31: Site Q North – Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Trespassing Teenager	1.9E-05	1.7E-01

A 10-acre area on Site Q North is currently used by River City Landscape Supply as a bulk storage terminal for lawn and garden products. Raw landscape products such as mulch, rock and soil are processed and packed on this portion of the site. Access to some portions of the site is restricted by fencing and gates. Other parts of the site have unrestricted access. As noted above, unacceptable risk for this area was identified for the construction/utility worker, not for the outdoor industrial worker. Therefore, the risks presented above are for a potential future construction/utility worker, as there is no current excavation work in this area.

Site Q Central

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. In addition, the total carcinogenic risk and the total HI for the trespassing teenager and the recreational angler from seep exposure are listed in Table 33. Carcinogenic risks were less than $1x10^{-4}$. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 32: Site Q Central- Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Indoor Industrial Worker	1.0E-05	1.5E+00
Outdoor Industrial Worker	7.5E-05	1.6E+00
Construction/Utility Worker	5.7E-06	5.2E-01
Trespassing Teenager	3.5E-05	2.1E-01

Table 33: Site Q Central Seep- Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Trespassing Teenager	1.0E-05	4.7E-01
Recreational Angler	4.0E-05	6.7E-01

Site Q Central houses a barge terminal facility and is largely covered by gravel or buildings. Therefore, the surface soil is not readily accessible in all locations. In 2007, construction of a rail, river barge, and truck transportation facility for the ethanol industry began on Site Q Central. Five 98,900-barrel capacity ethanol storage tanks are located on the site. Access to parts of Site Q Central is restricted by fences.

Site Q South

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. Carcinogenic risks greater than $1x10^{-4}$ are highlighted. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 34: Site Q South -Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Outdoor Industrial Worker	1.2E-04	6.7E+00
Construction/Utility Worker	9.3E-06	3.6E+00
Trespassing Teenager	1.4E-05	1.0E+00

Site Q South is predominantly vacant open land and access is unrestricted. The risks presented above for workers represent a potential future scenario.

Site Q South Ponds

The total risk and the total HI for the trespassing teenager and the recreational angler are listed below. Carcinogenic risks greater than $1x10^{-4}$ are highlighted. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 35: Site Q South Large Pond - Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Trespassing Teenager	2.0E-06	3.2E-01
Recreational Angler (with Black Bullhead Fillet)	5.6E-04	2.4E+01
Recreational Angler (with Carp Fillet)	1.4E-03	6.0E+01

Table 36: Site Q South Small Pond -Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Trespassing Teenager	2.3E-04	1.8E-01
Recreational Angler	3.0E-04	3.2E-01

Although risks were identified in the Site Q South Large Pond and Small Pond for trespassing teenagers and recreational anglers, it is important to note that these risks are only present as a result of flood events in the Mississippi River. After the ponds dry out, fish are not reintroduced until another flood event, although water may collect in the ponds from precipitation.

Site R

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. The total carcinogenic risk and the total HI for the trespassing teenager and the recreational angler seep exposure are also listed.

Carcinogenic risks greater than $1x10^{-4}$ are highlighted. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 37: Site R - Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Outdoor Industrial Worker	4.2E-01	4.7E+03
Construction/Utility Worker	8.8E-02	1.1E+04
Trespassing Teenager	7.0E-03	1.8E+02

Table 38: Site R Seep - Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Trespassing Teenager	9.0E-07	4.7E-02
Recreational Angler	3.5E-06	6.6E-02

Site R is a closed industrial-waste disposal area owned by Solutia, Inc. The site is not currently used. Access to Site R is restricted by fencing and is monitored by Solutia plant personnel. The trespasser and utility/construction worker risks represent a potential future scenario. Excavation is not allowed at Site R. There are no utilities located in Site R.

Site S

The total carcinogenic risk and the total HI for the outdoor industrial worker, the construction/utility worker, and the trespassing teenager are listed below. Carcinogenic risks greater than $1x10^{-4}$ are highlighted. HIs are highlighted where the total is greater than one on a target endpoint basis.

Table 39: Site S - Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Indoor Industrial Worker	2.0E-06	1.7E-03
Outdoor Industrial Worker	1.0E-03	6.6E+01
Construction/Utility Worker	4.3E-05	1.2E+01
Trespassing Teenager	5.6E-05	8.1E+00

The 1-acre site is currently not used. The northern portion of the site is grassed, and its southern portion is covered with gravel and fenced. Therefore, the potential risks presented above for workers represent the future scenario only.

Mississippi River

The total carcinogenic risk and the total HI for the trespassing teenager and the recreational angler are listed below.

Table 40: Mississippi River - Total Potential Risk and Hazard Index		
Receptor	**Cancer**	**Non-Cancer**
Trespassing Teenager	4.1E-08	1.7E-03
Recreational Angler- Plume Discharge Area	3.9E-06	6.0E-02
Recreational Angler – Upstream Discharge Area	3.9E-05	5.3E-01
Recreational Angler – Downstream Discharge Area	5.3E-06	8.2E-02

The risks noted above are below or within the target risk range of $1x10^{-6}$ to $1x10^{-4}$, and the potential HIs are below one. Because there were no unacceptable risks identified, no COCs are identified.

2.7.8 - Uncertainties

Uncertainty is inherent in the process of quantitative risk assessment because of the use of environmental sampling results, assumptions regarding exposure, and the quantitative representation of chemical toxicity. Potentially significant sources of uncertainty for this assessment are discussed in the HHRA and include analytical data, exposure estimates, toxicity estimates, and background conditions.

2.7.9 – Summary of Ecological Risk Assessment

In July 2008, the PRPs conducted a baseline ecological risk assessment (BERA), with EPA oversight, to evaluate the risks to ecological receptors on a site by site basis. Ecological risks to biological receptors living within the aquatic and terrestrial ecosystems located on or adjacent to the Sites, as a result of exposures to Site-related constituents were evaluated.

Surface water and sediment samples from locations upstream, adjacent to, and downstream of the Sites were collected and evaluated. The BERA concluded prior to the construction of the Sauget Area 2, OU2 interim remedial action for groundwater (known as the GMCS), there were some ecological risks associated with the presence of contaminants of potential ecological concern (COPEC) in Mississippi River sediments and surface water. After construction of the GMCS, there were no adverse ecological impacts associated with the presence of COPECs in Mississippi River sediments adjacent to or downstream of the sites or surface water. Thus, the risks posed by COPECs have been eliminated by the installation of the GMCS barrier wall.

The BERA identified risks associated with COPECs in surface soil at only two sites at the Sauget Area 2 Site: Site O and Site Q South. Ecological risks to herbivores and carnivores from exposure to dioxins/furans are present at Site O and Site Q South. Sites O (vole and fox) and Q (fox only) were considered to pose risks to mammals from exposure to dioxins/furans in the floodplain.

2.7.10 - Risk Assessment Conclusions

The 2008 ecological risk evaluation, as discussed above, concluded there were no adverse ecological impacts to Mississippi River sediments or surface water adjacent to or downstream of the Site due to contaminates discharging into the River from the Site. Thus, the risks to the Mississippi River have been eliminated by the installation of the GMCS barrier wall. However, two sites, Site O and Site Q South, had identified ecological risks associated with contaminants in surface soils.

The Vapor Intrusion HHRA evaluated buildings located on or nearby the Site with potentially complete vapor intrusion pathways, which included Site P, Q North, Q Central and S. Sites O, Q South, and R did not have buildings with complete vapor intrusion pathways; therefore were not evaluated in the Vapor Intrusion HHRA. The Vapor Intrusion HHRA concluded potential risks

from vapor intrusion to the indoor industrial worker were within EPA's acceptable levels for all the sites evaluated. However, vapor intrusion sampling and subsequent risk analysis could not rule out a potential for risk due to exposure to vapors inside the night club located at Site P and the RCLS warehouse located on Site Q North.

Previous removal actions conducted by EPA at Site Q Central and Site Q South have removed a significant source of principal threat wastes at the site by excavating and disposing off-Site approximately 3,271 drums and 14,000 tons of high-level PCB contaminated soil; thereby significantly reducing risk at the Site.

The remaining contaminant source areas at the Sauget Area 2 Site are the disposal areas at Sites O, O North, P, Q North, Q Central, Q South, R, and S. Risks or hazards above EPA's acceptable level for human health and the environment were identified in these disposal areas and summarized below.

In summary, risks and hazards were within or below EPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$ and a target hazard index of 1 on a target endpoint basis and, therefore, no COCs were identified in the soils, sediments, and surface water in the following area:

- Site O South

Some risks or hazards exceeded EPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$ and/or a target hazard index of 1 on a target endpoint basis and, therefore, COCs were identified for the following Sites:

- Site O and O North – Outdoor industrial worker, construction/utility worker, and trespassing teenager receptors
- Site P - Indoor industrial worker[12], outdoor industrial worker, and construction/utility worker receptors
- Site Q North – Indoor industrial worker[13], outdoor industrial worker, and construction/utility worker
- Site Q Central – Outdoor industrial worker
- Site Q South – Outdoor industrial worker, construction/utility worker, and trespassing teenager
- Site Q South Ponds - Recreational angler and trespassing teenager receptors
- Site R – Outdoor industrial worker, construction/utility worker, and trespassing teenager receptors

[12] Although the VI HHRA concluded risks and hazards are acceptable for the indoor industrial worker, vapor intrusion sampling and subsequent risk analysis could not rule out a potential for risk due to exposure to vapors inside the PT's Adult Entertainment located on Site P.

[13] Although the VI HHRA concluded risks and hazards are acceptable for the indoor industrial worker, vapor intrusion sampling and subsequent risk analysis could not rule out a potential for risk due to exposure to vapors inside the RCLS warehouse building located on Site Q North.

- Site S – Outdoor industrial worker, construction/utility worker, and trespassing teenager receptors

The potential risk to human health and the environment from COCs in soils, sediments, surface water, and groundwater sources at Sites O, O North, P, Q North, Q Central, Q South, R, and S drives the need for remedial action at OU1 of the Sauget Area 2 Site. The response action selected in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 – Remedial Action Objectives

Remedial action objectives (RAOs) are goals specific to media or operable units for protecting human health and the environment. Risk can be associated with current or potential future exposures. RAOs should be as specific as possible, but not so specific that the range of alternatives to be developed is unduly limited.

As discussed in Section 2.7, the HHRA recognized the following receptors for current and future land-use scenarios: indoor industrial workers, outdoor industrial workers, construction/utility workers, trespassing teenagers, and recreational anglers. Potential exposure routes for each receptor are depicted in the conceptual site model for human health (Figure 2). Current OU1 land uses are industrial/commercial, trespassing, and recreational angling. EPA assumed that future land uses of all properties would be the same as current land uses (e.g., industrial and commercial).

The following RAOs have been identified for the Sauget Area 2 Site based on the summary of receptor potential risks and hazards for the exposure scenarios presented in the HHRAs:

Site O and O North

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for future construction/utility work, industrial/commercial, and trespassing teenager uses.
- Minimize current and future migration of COCs from soil and waste to groundwater at levels causing unacceptable risks.
- Prevent ecological exposure to COCs in surface soils at levels causing unacceptable risk to the environment.
- Minimize migration of mobile source material.

Site P

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for industrial/commercial uses and future construction/utility work.

- Prevent human exposure to vapor intrusion into indoor air at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater.
- Minimize current and future migration of COCs from soil and waste to groundwater at levels causing unacceptable risks.
- Minimize migration of principal threat/ mobile source material.

Site Q North

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for industrial/commercial uses and future construction/utility work.
- Minimize current and future migration of COCs from soils and waste to groundwater at levels causing unacceptable risks.
- Minimize the potential for releases of COCs in wastes and soils due to bank erosion and Mississippi River flooding.
- Minimize migration of principal threat/mobile source material.
- Prevent human exposure to vapor intrusion into indoor air at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater.

Site Q Central

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for industrial/commercial uses and future construction/utility work.
- Minimize current and future migration of COCs from soils and waste to groundwater at levels causing unacceptable risks.
- Minimize the potential for releases of COCs in wastes and soils due to bank erosion and Mississippi River flooding.
- Minimize migration of principal threat/mobile source material.
- Prevent human exposure to vapor intrusion into indoor air in potential future buildings at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater.

Site Q South and Q South Ponds

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for industrial/commercial uses, construction/utility work, and trespassing teenagers.
- Minimize current and future migration of COCs from soils and waste to groundwater at levels causing unacceptable risks.

- Minimize the potential for releases of COCs in wastes and soils due to bank erosion and Mississippi River flooding.
- Minimize migration of principal threat/mobile source material.
- Prevent human exposure to vapor intrusion into indoor air in potential future buildings at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater.
- Prevent human exposure to particulates in outdoor air at levels that result in unacceptable risk from COCs in waste materials or soils due to future construction activities.
- Prevent ecological exposure to COCs in surface soils at levels causing unacceptable risk to the environment. Prevent human exposure to COCs in surface water and sediments via incidental ingestion and dermal contact while wading in the Site Q South ponds to trespassing teenagers.
- Prevent unacceptable risk to recreational angler resulting from exposure via ingestion of fish caught in the Site Q South ponds.

Site R

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for industrial commercial uses and future construction/utility work.
- Minimize the potential for releases of COCs in wastes or soils due to bank erosion and Mississippi River flooding.
- Minimize current and future migration of COCs from soil and waste to groundwater at levels causing unacceptable risks.
- Minimize migration of principal threat/mobile source material.
- Prevent human exposure to vapors released to outdoor air at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater due to trespassing.
- Prevent human exposure to vapor intrusion into indoor air in potential future buildings at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater.

Site S

- Prevent human exposure to COCs in surface and near-surface wastes and soils at levels causing unacceptable risk for industrial/commercial uses, construction/utility work, and trespassing teenagers.
- Minimize current and future migration of COCs from soil and waste to groundwater at levels causing unacceptable risks.
- Minimize migration of mobile source material.

- Prevent human exposure to vapor intrusion into indoor air in potential future buildings at levels that result in unacceptable risk from COCs in waste materials, soils, or groundwater.

A clean-up that achieves these RAOs will be protective of human health and the environment because it will address current and future risks above EPA-acceptable levels in Site media.

Remedial Goals

For potentially carcinogenic risk results, COCs are identified as those COPCs that cause an exceedance of the target risk level of $1x10^{-4}$. For non-carcinogenic hazard results, COCs are identified as those COPCs that cause an exceedance of the toxic-endpoint specific HI of 1. Remediation goal options (RGOs) have been calculated for those COPCs identified as COCs in the HHRAs. RGOs are summarized in Appendix E of this ROD.

2.9 – Description of Alternatives

This section presents the remedial alternatives for OU1, which are numbered to correspond with the numbering system used in the FS Report. The alternatives are described more fully in Section 2.9.2.

In accordance with EPA guidance, the potential remedial alternatives identified in the FS were screened against three broad criteria: (1) effectiveness (both short-term and long-term), (2) implementability (including technical and administrative feasibility), and (3) relative cost (capital and operation and maintenance (O&M)). The purpose of the screening evaluation was to reduce the number of alternatives chosen for a more thorough analysis.

2.9.1 - Common Element of Alternatives

All of the alternatives, except Alternatives O1, P1, QN1, QC1, QS1, R1, and S1 ("no action" alternatives) include the following common elements:

Engineered Caps - Engineered caps minimize the potential for exposure to COCs in soils and waste in covered areas. The types of engineered caps selected for a remedial alternative will vary depending on the existing uses of the Sites and the types of fill or waste materials present at the Sites and will follow the requirements of the federal or more stringent state requirements.

Federal regulations governing hazardous waste landfill closure are RCRA Subpart G (Closure and Post-Closure) and Subpart N (Closure and Post-Closure for Landfills). Illinois has been authorized by EPA to implement RCRA. The corresponding Illinois regulations are 35 Illinois Administrative Code (IAC) Part 724, Subtitle G (Waste Disposal), Subchapter C, Subpart G (Closure and Post-Closure), Sections 724.400 to 724.417. Groundwater monitoring requirements are identified in 35 IAC 724.197. These requirements are equivalent to the federal requirements. In addition, the Illinois solid waste landfill requirements, including closure and post-closure care (Subpart E), for non-hazardous waste are presented in 35 IAC Part 807.

The types of engineered covers included in the remedial alternatives for the Sauget Area 2 Sites include RCRA Subtitle C designed caps, 35IAC § 724[14] compliant soil caps, 35 IAC § 724 compliant crushed rock caps, asphalt caps, and 35 IAC § 807 caps.

RCRA Subtitle C designed caps are multi-layer caps that promote surface water drainage and minimize surface water infiltration into subsurface soils that lie beneath the capped area. They include a low-permeability layer underlain by a gas collection layer and overlain by a drainage layer and protective soil cover and vegetative layer. At traffic areas, the protective surface layer of a RCRA Subtitle C designed cap can be constructed of alternate materials such as crushed rock or asphalt pavement.

A 35 IAC § 724 compliant soil or crushed rock cap will meet the performance standards of a RCRA Subtitle C cap, except the component requiring long-term minimization of migration of liquids. This component is not appropriate for the Sauget Area 2 Sites (see Section 2.10.2). Both the soil and crushed rock caps will use clean material to minimize potential for exposure to COCs in soil and waste. Both caps would require a minimum of two feet of suitable material. Crushed rock caps will use granular material to cover an area. The granular material can be free-draining or less permeable material, depending on Site-specific conditions.

35 IAC § 807 caps generally consist of 6 inches of soil overlying approximately 18 inches of compacted clay over the waste areas.

Asphalt caps include a prepared sub-grade, aggregate base, and an asphalt surface layer. The pavement and aggregate base thickness can be tailored to location specific conditions. Asphalt covers require long-term inspection and maintenance to retain their effectiveness to reduce surface water infiltration and significantly reduce the potential for exposure to COCs in the covered area.

Details of the engineered cap designs for Sauget Area 2 would be developed during the remedial design process.

Institutional and Access Controls – Institutional controls are designed to control access to the Site, manage construction or other intrusive activities that may disturb soil or waste, minimize potential exposure to COCs, and ensure that groundwater is not used for drinking water purposes. Institutional controls that could be implemented include deed restrictions, zoning restrictions and access restrictions such as fences or warning signs. At a minimum, institutional

[14] Subtitle C of RCRA, 42 U.S.C §§ 6921-6939e, directs the EPA Administrator, among other things, to regulate the owners and operators of hazardous waste treatment, storage, and disposal ("TSD") facilities, including landfills. Pursuant to this statutory scheme, EPA has promulgated regulations, codified at 40 C.F.R. Parts 264 and Illinois has adopted analogous regulations codified at 35 IAC Part 724 establishing standards applicable to hazardous waste generators, transporters, and TSD facilities. The federal regulations governing hazardous waste landfill closure are at 40 CFR Part 264, Subpart G (Closure and Post-Closure) and Subpart N (Landfills) *See* 40 CFR § 264.310. Illinois has been authorized by EPA to implement RCRA through its state law and regulations. The corresponding Illinois regulations are 35 IAC Part 724, Subpart G (Closure and Post-Closure Care) and Subpart N (Landfills) *See* 35 IAC § 724.410. These requirements are equivalent to the federal requirements. In addition, the Illinois solid waste landfill requirements for non hazardous waste are presented in 35 IAC Part 807.

controls will be implemented in accordance with the Illinois Uniform Environmental Covenant Act to restrict residential development of the Site. Consistent with expectations set out in the Superfund regulations, none of the remedies rely exclusively on institutional controls to achieve protectiveness. A detailed description of the institutional controls for Sauget Area 2 will be developed in an Institutional Controls Implementation Plan to be prepared during the remedial design process.

2.9.2 – Summary of Remedial Alternatives

Alternatives O1, P1, Q1, R1, and S1:

- **No Action**

Estimated Capital Cost: $0
Estimated Total O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Timeframe: None

Regulations governing the Superfund program require that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action at the Site to prevent exposure to the soil and groundwater source contamination.

Site O and O North
Alternative O2:

- **35 IAC § 724 Compliant Soil Cap Over Identified Waste Areas**
- **Institutional and Access Controls**

Estimated Capital Cost: $5,900,000
Estimated O&M Present Worth Cost: $420,000
Estimated Present Worth Cost: $6,300,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements" above. This alternative includes a 35 IAC § 724 compliant soil cap over the identified waste areas and institutional controls. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a) as shown on Figure 4. Through RI sampling, it is believed that much of the site already has a minimum of 2 feet of soil cover. These areas would not require additional soil cover if the pre-design investigation can confirm cover thickness. Areas requiring additional cover in order to meet the 2-foot minimum requirement would be identified during the pre-design investigation.

Alternative O3:

- **Phytotechnology in Potentially Mobile Source Areas**
- **35 IAC § 724 Compliant Soil Cap Over Remainder of Identified Waste Areas**
- **Institutional and Access Controls**

Estimated Capital Cost: $5,400,000
Estimated Present Worth O&M Cost: $400,000
Estimated Present Worth Cost: $5,800,000
Estimated Construction Timeframe: 1 to 2 years

This alternative includes the components of Alternative O2 above, with phytotechnology in the potential mobile source areas, as described below. Institutional controls and engineered caps were described under "Common Elements" above. This alternative includes a 35 IAC § 724 compliant soil cap over the identified waste areas and institutional controls. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a) as shown on Figure 5 outside of areas subject to phytotechnology, as described below.

Phytotechnology in Potential Mobile Source Areas - This process option involves a soil cover and phytotechnology in potential mobile source areas, as shown on Figure 5. Phytotechnology is the use of specially selected plants to provide added benefit in contaminant reduction (i.e., remediation) of selected COCs. It utilizes a variety of plant biological processes and the physical characteristics of plants to aid in Site remediation. Phytotechnology encompasses a number of different processes that can lead to contaminant degradation, removal (through accumulation or dissipation), or immobilization including: degradation, rhizodegradation (enhancement of biodegradation in the below-ground root zone by microorganisms), phytodegradation (contaminant uptake and metabolism above or below ground, within the root, stem, or leaves), phytoextraction (contaminant uptake and accumulation), phytovolatilization (contaminant uptake and volatilization), and phytostabilization (contaminant immobilization in the soil). Phytotechnology enhanced vegetated covers can combine a variety of these methods for containment, removal, and/or destruction of COCs.

Alternative O4:

- **RCRA Subtitle C Designed Cap Over Identified Waste Areas**
- **Institutional and Access Controls**

Estimated Capital Cost: $16,000,000
Estimated Present Worth O&M Cost: $600,000
Estimated Present Worth Cost: $17,000,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements" above. This alternative includes a RCRA subtitle C designed cap over the identified waste areas. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 4.

Site P

Alternative P2:

- **Asphalt Cover Over Potentially Mobile Source Area (SA-P-3/AT-P-5)**
- **35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $2,300,000
Estimated Present Worth O&M Cost: $ 300,000
Estimated Present Worth Cost: $2,600,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements" above. The additional component of Alternative P is described below. This alternative includes asphalt and 35 IAC § 807 caps over the identified waste areas, as identified in Figure 6, and institutional controls. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a) as shown on Figure 6, outside of the area with an asphalt cover.

Vapor Intrusion Mitigation - Vapor intrusion sampling during the RI and the subsequent risk analysis could not rule out the potential for risk due to exposure to vapors inside the nightclub. As part of the Site P remedial design, indoor air and/or sub-slab sampling will be completed to further evaluate if a potential risk does exist. If the analysis indicates a potential risk does exist, a vapor control system would be designed and installed inside the nightclub as part of Alternative P2. Institutional controls will also be implemented to address vapor intrusion into any newly constructed buildings within the boundaries of the Site. Vapor intrusion would be addressed through an evaluation of each new building and vapor mitigation measures would be designed into the building to address any potential unacceptable risk.

Alternative P3:

- **NAPL Collection at Well LEACH P-1**
- **Asphalt Cap Over Potentially Mobile Source Area (SA-P-3/AT-P-5)**
- **35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $2,300,000
Estimated Present Worth O&M Cost: $600,000
Estimated Present Worth Cost: $2,900,000
Estimated Construction Timeframe: 1 to 2 years

This alternative includes the components of Alternative P2 above, and NAPL collection at well LEACH P-1, as described below.

NAPL Collection at Well LEACH P-1 - The NAPL recovery well system for Site P will include a pump and a collection and storage system to remove NAPL that accumulates in the well. Accumulated NAPL will be periodically removed from the storage system and disposed of in compliance with state and federal regulations. The complete system and details of operation will be specified in the remedial design. The endpoint for the NAPL recovery system will be when NAPL reaches an asymptotic rate of recovery based on empirical recovery data.

Alternative P4:

- **Asphalt Cover Over Potentially Mobile Source Area (SA-P-3/AT-P-5)**
- **RCRA Subtitle C Designed Cap Over Remainder of Identified Waste Areas**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $4,700,000
Estimated Present Worth O&M Cost: $450,000
Estimated Present Worth Cost: $5,200,000

Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements" above. Vapor intrusion migration was discussed under Alternative P2 above. This alternative includes asphalt and RCRA Subtitle C designed caps over the identified waste areas, as identified in Figure 6, and institutional controls. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a) as shown on Figure 6, outside of the area with an asphalt cover, as identified on Figure 6.

Site Q North

Alternative QN2:

- **35 IAC § 724 Compliant Crushed Rock Cap Over Dogleg Area**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $1,100,000
Estimated Present Worth O&M Cost: $170,000
Estimated Present Worth Cost: $1,300,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements" above. The additional component of Alternative QN2 is described below. This alternative includes a 35 IAC § 724 crushed rock cap over the dogleg area, as shown on Figure 7.

Vapor Intrusion Mitigation - Vapor intrusion sampling during the RI and the subsequent risk analysis could not rule out the potential for risk due to exposure to vapors inside the warehouse building. As part of the Site Q North remedial design, indoor air and/or sub-slab sampling will be completed to further evaluate if a potential risk does exist. If the analysis indicates a potential risk does exist, a vapor control system would be designed and installed inside the warehouse building as part of Alternative QN2. Institutional controls will also be implemented to address vapor intrusion into any newly constructed buildings within the boundaries of the Site. Vapor intrusion would be addressed through an evaluation of each new building and vapor mitigation measures would be designed into the building to address any potential unacceptable risk.

Alternative QN3:

- **RCRA Subtitle C Designed Cap Over Dogleg Area**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $12,000,000
Estimated Present Worth O&M Cost: $550,000
Estimated Present Worth Cost: $13,000,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." Vapor intrusion mitigation is described under Alternative QN2 above. This alternative includes a RCRA Subtitle C designed cap over the dogleg area, as shown on Figure 7.

Alternative QN4:

- **RCRA Subtitle C Designed Cover Over Identified Waste Areas**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $32,000,000
Estimated Present Worth O&M Cost: $1,400,000
Estimated Present Worth Cost: $33,400,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." Vapor intrusion mitigation is described under Alternative QN2 above. This alternative includes a RCRA subtitle C designed cap over the identified waste areas, as identified on Figure 8. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 8.

Alternative QN5:

- **35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas**
- **Vapor Intrusion Mitigation**
- **Institutional and Access Controls**

Estimated Capital Cost: $2,700,000
Estimated Present Worth O&M Cost: $340,000
Estimated Present Worth Cost: $3,000,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered covers were described under "Common Elements." Vapor intrusion mitigation is described under Alternative QN2 above. This alternative includes a 35 IAC § 724 compliant crushed rock cap over the identified waste areas. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 8.

Site Q Central
Alternative QC2:

- **35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas**
- **Shoreline Erosion Protection**
- **Institutional and Access Controls**

Estimated Capital Cost: $1,900,000
Estimated Present Worth O&M Cost: $200,000
Estimated Present Worth Cost: $2,100,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." The additional component of Alternative QC2 is described below. This alternative includes a 35 IAC § 724 compliant crushed rock cap over the identified waste areas, as shown on Figure 9. The areas to be capped under this alternative are the areas where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 9.

Shoreline Erosion Protection - Site Q Central encompasses approximately 1,500 feet of shoreline along the east bank of the Mississippi River. Approximately 1,000 feet of the shoreline has been covered with riprap to provide erosion protection. There is a segment of the shoreline located upstream of an existing barge ramp where the riprap is not as dense as other areas. A localized area near this segment experienced significant erosion during the 1993 flood event. The eroded area was repaired after the flood event. Alternative QC2 includes placement of additional riprap along portions of the shoreline upstream of the barge ramp to supplement the existing riprap to provide additional shoreline protection. The segment to receive additional riprap is estimated to be 470 feet long.

Alternative QC3:

- **In-Situ SVE Treatment of Potentially Mobile Source Area at AT-Q32**
- **35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas**
- **Shoreline Erosion Protection**
- **Institutional and Access Controls**

Estimated Capital Cost: $2,400,000
Estimated Present Worth O&M Cost: $380,000
Estimated Present Worth Cost: $2,800,000
Estimated Construction Timeframe: 1 to 2 years

This alternative includes the components of Alternative QC2 above, and in-situ SVE treatment of potentially mobile source areas at AT-Q32, as described below.

In-situ SVE Treatment of Potentially Mobile Source Area at AT-Q32 - This component includes a soil vapor extraction (SVE) system to address the potential mobile source area near the barge ramp (Figure 10). The conceptual SVE system includes the following components: pilot test; a horizontal soil vapor extraction well; thermal oxidation unit with a propane fuel tank; vapor phase carbon adsorption system; liquid phase carbon adsorption system for knockout drum liquids; three vapor phase monitoring points; and O&M of the SVE system. The feasibility study description of Alternative QC3 included surface water sampling and/or sediment sampling during pre-design to determine whether SVE is warranted. This aspect of QC3 has been deleted and the SVE system is included in QC3 with no contingency based on sampling.

Alternative QC4:

- **RCRA Subtitle C Designed Cap Over Identified Waste Areas**
- **Shoreline Erosion Protection**
- **Institutional and Access Controls**

Estimated Capital Cost: $38,000,000
Estimated Present Worth O&M Cost: $1,200,000
Estimated Present Worth Cost: $40,000,000
Estimated Construction Timeframe: 1 to 2 years

This alternative is similar to Alternative QC2 above, except the cap is a RCRA subtitle C designed cap, as shown on Figure 10. The area to be capped under this alternative is the area where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 10.

Site Q South and Q South Ponds

Alternative QS2:

- **Removal of Intact Drums at AT-Q35**
- **35 IAC § 724 Compliant Cap Over Identified Risk Areas**
- **Institutional and Access Controls**

Estimated Capital Cost: $1,900,000
Estimated Present Worth O&M Cost: $130,000
Estimated Present Worth Cost: $2,000,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." The additional component of Alternative QS2 is described below. This alternative includes a 35 IAC § 724 compliant cap over identified risk areas, as shown on Figure 11. The area to be capped under this alternative is the area exceeding acceptable risk levels as identified in the RI (URS, 2008a) and shown on Figure 11. Capping Site Q South will mitigate contaminant transport via run-off to the Site Q South Ponds. Since implementation of the interim groundwater remedy, there are no on-going ecological risks in the Mississippi River from the Site. The interim groundwater remedy has thus reduced the potential for flooding from the Mississippi River to further impact the Site Q South Ponds.

Removal of Intact Drums at AT-Q35 - This alternative includes removal of intact drums located in the previously excavated RI trench AT-Q-35. The location of this former trench will be identified and re-excavated to the same dimensions (e.g., length, width, depth) as previously excavated. Any intact drums identified within the trench will be removed, placed in over pack drums, and treated/disposed off-site in accordance with EPA and Illinois EPA regulations. If intact drums are visible in the trench, the trench will be expanded to remove them to a maximum dimension of 2,500 square feet. Following removal of any intact drums, the excavated area will be backfilled with the soil removed from the trench and clean soil, and appropriately covered.

Alternative QS3:

- **Removal of Intact Drums at AT-Q35**
- **35 IAC § 724 Compliant Cap Over Identified Waste Areas**
- **Institutional and Access Controls**

Estimated Capital Cost: $4,300,000
Estimated Present Worth O&M Cost: $200,000
Estimated Present Worth Cost: $4,500,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." Removal of intact drums is described under QS2 above. This alternative includes a 35 IAC § 724 compliant soil cap over identified waste areas. The area to be capped under this alternative is the area where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 12.

Alternative QS4:

- **RCRA Subtitle C Designed Cap Over Identified Waste Areas**
- **Institutional and Access Controls**

Estimated Capital Cost: $8,400,000
Estimated Present Worth O&M Cost: $320,000
Estimated Present Worth Cost: $8,700,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered covers were described under "Common Elements." This alternative includes a RCRA subtitle C designed cap over identified waste areas, as shown on Figure 12. The area to be capped under this alternative is the area where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 12.

Site R
Alternative R2:

- **35 IAC § 724 Compliant Soil Cap Over Entire Site**
- **Institutional and Access Controls**

Estimated Capital Cost: $1,700,000
Estimated Present Worth O&M Cost: $310,000
Estimated Present Worth Cost: $2,000,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered covers were described under "Common Elements." This alternative includes a 35 IAC § 724 compliant soil cap over the entire site, as shown on Figure 13. The area to be capped under this alternative is the area where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 13.

An engineered soil cap is currently present at Site R and is expected to meet the minimum 24-inch cover requirement over the entire area to be covered. However, a pre-design investigation will be required to document the thickness and condition of the existing soil cover. The objective of this pre-design is to ensure that a minimum of 2 feet of compacted clay soil exists over the former landfill area, not including the slurry wall spoils materials placed on top of Site R during the GMCS construction.

Alternative R3:

- **RCRA Subtitle C Designed Cap Over Entire Site**
- **Institutional and Access Controls**

Estimated Capital Cost: $8,9000,000
Estimated Present Worth O&M Cost: $290,000
Estimated Present Worth Cost: $9,200,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." This alternative is similar to Alternative R2 above, except the cap is a RCRA subtitle C designed cap, as shown on Figure 13. The area to be capped under this alternative is the area where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 13.

Site S

Alternative S2:

- **35 IAC § 724 Compliant Soil Cap Over Entire Site**
- **Institutional and Access Controls**

Estimated Capital Cost: $230,000
Estimated Present Worth O&M Cost: $92,000
Estimated Present Worth Cost: $320,000
Estimated Construction Timeframe: 1 to 2 years

Institutional controls and engineered caps were described under "Common Elements." This alternative includes a 35 IAC § 724 compliant soil cap over the entire site, as shown on Figure 14. The area to be capped under this alternative is the area where industrial waste was identified in the RI (URS, 2008a), as shown on Figure 14.

Alternative S3:

- **In-Situ SVE Treatment of Potentially Mobile Source Areas**
- **35 IAC § 724 Compliant Soil Cap Over Entire Site**
- **Institutional and Access Controls**

Estimated Capital Cost: $800,000
Estimated Present Worth O&M Cost: $240,000
Estimated Present Worth Cost: $1,000,000
Estimated Construction Timeframe: 1 to 2 years

This alternative includes the components of Alternative S2 above, and in-situ SVE treatment of potentially mobile source areas, as described below. This alternative includes a 35 IAC § 724 compliant soil cap over the entire site, as shown on Figure 14.

In-situ SVE Treatment of Potentially Mobile Source Areas - The conceptual design of this SVE system at Site S is similar to the SVE system described for Alternative QC3 except that vertical extraction wells will be used rather than a horizontal extraction well. Design details for the SVE system will be based on pilot testing completed during the remedial design.

Alternative S4:

- **RCRA Subtitle C Designed Cap Over Entire Site**
- **Institutional and Access Controls**

Estimated Capital Cost: $570,000
Estimated Present Worth O&M Cost: $ 92,000
Estimated Present Worth Cost: $660,000
Estimated Construction Timeframe: 1 to 2 years

This alternative is similar to Alternative S2 above, except the cap is a RCRA Subtitle C cap over the entire site, as shown on Figure 14.

2.10 – Comparative Analysis of Alternatives

As required by CERCLA, nine criteria were used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Record of Decision summarizes the performance of each alternative against the nine criteria and notes how they compare to the other options under consideration.

The nine evaluation criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. Threshold criteria, which include overall protection of human health and the environment and compliance with ARARs, are requirements that each alternative must meet in order to be eligible for selection. Primary balancing criteria, which include long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants through treatment, short-term effectiveness, implementability, and cost, are used to weigh major trade-offs among alternatives. Modifying criteria include state/support agency acceptance and community acceptance, and are assessed after public comment is received on the Proposed Plan. In the final balancing of trade-offs between alternatives, upon which the final remedy selection is based, modifying criteria are of equal importance to the balancing criteria. The nine evaluation criteria are discussed below.

2.10.1 - Overall Protection of Human Health and the Environment

This criterion assesses how well the alternatives achieve and maintain protection of human health and the environment.

This evaluation criterion assesses whether each remedial alternative protects human health and the environment. This assessment focuses on how an alternative achieves protection over time and indicates how each source of contamination would be minimized, reduced, or controlled through treatment, engineering, or institutional controls. The evaluation of the degree of overall protection associated with each alternative is based largely on the exposure pathways and scenarios set forth in the baseline human health risk assessment (HHRA).

The "No Action" Alternatives O1, P1, QN1, QC1, QS1, R1 and S1 are not protective of human health or the environment because they do not meet the RAOs developed for the affected soils and waste at Sites O, O North, P, Q North, Q Central, Q South, R, or S; are not protective of human health and the environment; and do not comply with the ARARs identified for each of these sites. Because Alternatives O1, P1, QN1, QC1, QS1, R1 and S1 are not protective of human health and the environment, they are eliminated from consideration under the remaining eight criteria.

The engineered caps included in Alternatives O2, O3, O4, P2, P3, P4, QN2, QN3, QN4, QN5, QC2, QC3, QC4, QS2, QS3, QS4, R2, R3, S2, S3, and S4 achieve the RAO for surface and subsurface soil and the RAO for waste and leachate. These engineered caps, in conjunction with the institutional controls, minimize the potential for human exposure to COCs at the fill area and prevent erosion of the fill areas.

Alternatives O2, O3, O4, QC2, QC3, QC4, QS2, QS3, QS4, R2, R3, S2, S3, and S4 achieve the soil vapor RAO. Results of the vapor intrusion HHRA indicate that concentrations of COCs found in soil vapor do not pose an unacceptable risk to human receptors in existing buildings at Site O, Q Central, R, and S. Alternatives P2, P3, P4, QN2, QN3, QN4, and QN5 achieve the soil vapor RAO through the vapor mitigation component of these alternatives. O2, O3, O4, P2, P3, P4, QN2, QN3, QN4, QN5, QC2, QC3, QC4, QS2, QS3, QS4, R2, R3, S2, S3, and S4 include institutional controls that will prevent construction of new buildings on the source areas without vapor controls.

2.10.2 - Compliance with Applicable or Relevant and Appropriate Requirements

This criterion assesses how the alternatives comply with regulatory requirements. Federal and state regulatory requirements that are either applicable or relevant and appropriate are known as ARARs. Only state requirements that are more stringent than federal requirements are ARARs. There are three different categories of ARARs: chemical-specific, action-specific, and location-specific ARARs.

Landfill Closure/Post-Closure

Alternatives O2, O3, O4, P2, P3, P4, QN2, QN3, QN4, QN5, QC2, QC3, QC4, QS2, QS3, QS4, R2, R3, S2, S3, and S4 can be designed and implemented to comply with ARARs relating to closure and post-closure requirements for landfills, specifically 35 IAC § 724, which contain the standards for owners and operators of hazardous waste treatment, storage, and disposal facilities, and 35 IAC § 807 for Alternatives P2, P3, and P4, which contain standards for solid waste landfills. Although the 35 IAC § 807 standards for solid waste landfills are relevant to Sauget Area 2, they are not appropriate at Site O, O North, Q North, Q Central, Q South, R, and S because the hazardous waste landfill requirements of 35 IAC § 724 are better suited to Site conditions. However, Site P was operated as a permitted municipal solid waste landfill and as a result, the requirements of 35 IAC § 807 are applicable to closure and post-closure.

The engineered caps in Alternatives O2, O3, QN2, QN5, QC2, QC3, QS2, QS3, R2, S2, and S3 all comply with 35 IAC § 724.410's performance standards of functioning with minimal maintenance, promoting drainage, and minimizing erosion of the cap, and could accommodate settling and subsidence so that the cap's integrity is maintained. However, 35 IAC § 724.410's performance standard for providing long-term minimization of migration of liquids (including the RCRA Subtitle C designed cap proposed in Alternatives O4, QN3, QN4, QC4, QS4, R3, and S4) is not appropriate for Sites O, O North, Q North, Q Central, Q South and Site R because of the following:

Site O and O North:

- Groundwater data from the shallow hydraulic unit (SHU) indicated relatively minor impacts at Site O.
- Impacted groundwater at Site O is intercepted and treated by the GMCS and does not reach, or discharge, to the Mississippi River.

- The area of potential human health and ecological risk identified at Site O would be addressed by the cover included in the Selected Remedy for Site O: Alternative O2.
- No principal threat materials were identified at Site O.

Site Q North:

- Impacted groundwater from Site Q North-Dogleg is intercepted and treated by the GCMS and does not reach, or discharge, to the Mississippi River.
- Due to the proximity of Site Q North to the River and documented groundwater fluctuation based on the rising and falling River levels, installation of any type of cover to minimize infiltration would not address flushing effects from the rising and falling water table.

Site Q Central:

- No TCLP[15] samples collected during the RI failed TCLP.
- Groundwater data from the SHU indicated relatively minor impacts at Site Q Central.
- Due to the proximity of Site Q North to the River and documented groundwater fluctuation based on river levels, installation of any type of cover to minimize infiltration would not address flushing effects from the rising and falling water table.
- No principal threat wastes were identified at Site Q Central.

Site Q South:

- Area of principal threat wastes at Site Q South will be addressed by removing the intact drums in the Selected Remedy for Site Q South.
- Groundwater data from the SHU indicated relatively minor impacts at Site Q South.

Site R:

- Site R is currently covered with approximately 5 feet of compacted clay.
- Impacted groundwater from Site R is intercepted and treated by the GMCS.

Polychlorinated Biphenyls (PCB) Regulation of Remediation Waste

As mentioned in Section 2.2, previous removal actions conducted by EPA at Site Q Central and Site Q South already have removed principal threat wastes by excavating and disposing off-Site approximately 3,271 drums and 14,000 tons of high-level polychlorinated biphenyls (PCB) contaminated soil. The remaining areas containing PCBs at the Sauget Area 2 Site are the disposal areas at Sites O, P, Q, R, and S. These disposal areas contain municipal and industrial waste materials, including crushed or partially crushed drums, drum fragments, debris, and miscellaneous trash. Collectively, Sites O, P, Q, R, and S contain an estimated 4.5 million

[15] Toxicity Characteristic Leaching Procedure (TCLP) is a soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill. The testing methodology is used to determine if a waste is characteristically hazardous.

cubic yards of soil and waste. The lower portion of the waste at these Sites is below the water table. Remedial investigation sampling at Sites O, Q North, R, and S revealed PCB levels in the soil above 50 ppm. Soil samples taken from subsurface soil and waste showed PCB concentrations ranging from zero to 990 ppm at Site O, zero to 90 ppm at Q North, zero to 2 ppm at Site Q Central, zero to 10 ppm at Site Q South, zero to 130 ppm at Site R, and zero to 20 ppm at Site S.

The PCB-contaminated soils and wastes in the disposal areas in Sauget Area 2 Sites O, Q North, R, and S meet the definition of a PCB remediation waste as defined under 40 CFR § 761.3 because the soils and wastes contain PCBs as a result of a spill, release or unauthorized disposal which occurred prior to April 18, 1978, and thus are regulated for cleanup and disposal under 40 CFR Part 761. The requirements under TSCA and 40 CFR § 761.61(c) will be met through implementation of the Selected Remedy for OU1 at the Sauget Area 2 Site, as described below:

This Selected Remedy for OU1 at the Sauget Area 2 Site addresses principal threat wastes[16] that are present at the Site, and in so doing, addresses unreasonable Site risks posed by PCBs. As mentioned, previous removal actions conducted by EPA at Site Q Central and Site Q South already have removed and disposed off-Site 3,271 drums and approximately 14,000 tons of high-level PCB contaminated soil wastes. EPA also ordered the construction of a Groundwater Migration and Control System (GMCS) next to the Mississippi River as an early interim OU2 groundwater remedy to capture and treat area groundwater before it releases to the River.[17] However, to the degree that additional principal threat wastes containing PCBs remain at Site P, Q North, Q South, and R, the Selected Remedy applies treatment and containment strategies to these areas. Specifically, the NAPL found in Sites P and Q South (which only contains low levels of PCB) is recovered and treated, through off-Site incineration, and the intact drums located on Site Q South, which may contain PCB waste, are removed and properly disposed of under the Selected Remedy. The NAPL identified on Site Q North and Site R (which only contains low levels of PCB) are captured and treated by the Sauget Area 2 GMCS. Potential risks remaining at the Site related to PCB contamination is through potential direct contact to soils and waste contaminated with PCBs. To eliminate the direct contact exposure pathway, engineering controls[18] in the form of engineered covers are used in the Selected Remedy. Specifically, engineered covers meeting the requirements of 35 IAC § 724 compliant caps will be installed over Sites O, Q North, Q Central, Q South, R, and S, and 35 IAC § 807 caps will be installed over Site P.

Under 40 CFR § 761.61(c), PCB remediation waste may be disposed of in a manner other than prescribed under Section 761.61(a) or (b), provided EPA determines that the method of disposal does not result in an unreasonable risk of injury to health or the environment. The risks associated with PCBs at the Sauget Area 2 Site are for dermal contact and incidental ingestion of

[16] Principal threat waste is a source material that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur.

[17] For a description of the GMCS, see footnote 3

[18] Engineering controls encompass a variety of engineered and constructed physical barriers (e.g., soil capping, sub-surface venting systems, mitigation barriers, fences) to contain and/or prevent exposure to contamination on a property.

surface soils at Site O and Site S to an outdoor industrial worker, and with subsurface soils and waste at Sites O, P, Q North, R, and S through dermal contact, incidental ingestion, and inhalation of particulate matter in excavation for a construction worker. Engineered caps and institutional and access controls will address these risks due to PCBs at the Site by eliminating the direct contact exposure pathway. PCBs were not identified as a contaminant of potential concern for vapor intrusion; therefore PCBs do not present a vapor intrusion risk.

The Selected Remedy set forth in the Sauget Area 2 OU1 ROD implements both containment and treatment remedies. Specifically, the 35 IAC § 724 compliant caps and 35 IAC § 807 caps prevent or minimize human exposure, infiltration of water, and erosion in accordance with 40 C.F.R. § 761.61(a)(7)[19]. The additional remedy components of the Selected Remedy at the Sauget Area 2 Site include NAPL recovery at Site P; removal and off-Site treatment and disposal of intact drums at Site Q South; in-situ soil vapor extraction at Site Q Central and Site S; vapor mitigation at Site P and Site Q North; and institutional controls placed on Sauget Area 2 Sites O, P, Q, R, and S to prevent interference with the remedy by future users. As discussed above, PCB concentrations in groundwater occur only sporadically and at comparatively low concentrations both upgradient and downgradient of the disposal areas, throughout the aquifer. In any case, impacted groundwater from Sauget Area 2 moves toward the west, toward the Mississippi River, and also most of the groundwater that might reach the River is captured and treated by the GMCS.

The Selected Remedy is expected to achieve substantial and long-term risk reduction through treatment, it is expected to prevent future exposure to currently contaminated soils and groundwater, and it is expected to allow the property to be used for the reasonably anticipated future land use, which is industrial. Based on the information provided, the containment and treatment remedies for the Sauget Area 2 Sites O, P, Q, R, and S will ensure that the PCBs remaining in the subsoils in Sauget Area 2 will not pose an unreasonable risk of injury to health or the environment.

EPA's TSCA 40 CFR § 761.61(c) determination memorandum is included in Appendix F, and is based on EPA's finding that after the remedy selected in this ROD is implemented, the PCB-contaminated soils remaining on-Site will not pose an unreasonable risk of injury to health or the environment.

Floodplain Regulations

Alternatives QN2, QN3, QN4, QN5, QC2, QC3, QC4, QS2, QS3, QS4, R2, and R3 are located on the wet side of the levee and involve the placement of fill and other cover materials in the

[19] Under the Selected Remedy, the 35 IAC § 724 cap will meet the performance standards of a fully designed RCRA Subtitle C cap, except the component stating the need to provide for long-term minimization of migration of liquids (through the placement of an impermeable cap). EPA determined that this component of the Section 724 cap is not appropriate because an impermeable cap would not affect significant change on the rate of leaching in the groundwater due to the physical conditions at the Site.

Mississippi River floodway. For these alternatives, placement of the cover system must not adversely increase the flood elevation and velocities associated with reductions in floodway storage capacity (17 IAC Part 3700, Construction in Floodways of Rivers, Lakes, and Streams).

The ARARs that have been identified for the Selected Remedy in this ROD are listed in Appendix B.

2.10.3 - Long-term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the risk remaining at the site after response objectives have been met. All of the alternatives, except the No Action alternatives, provide effective and long-term protection. Alternatives O2, O3, O4, P2, P3, P4, QN2, QN3, QN4, QN5, QC2, QC3, QC4, QS2, QS3, QS4, R2, R3, S2, S3, and S4 are effective, permanent remedial alternatives that meet the RAOs for Sauget Area 2. Alternatives O2, O4, P2, P4, QN2, QN3, QN4, QN5, QC2, QC4, QS4, R2, R3, S2, and S4 provide a similar measure of long-term effectiveness and permanence after construction of the engineered covers is complete. Alternatives P3, QC3, QS2, QS3, and S3 provide a higher degree of effectiveness by reducing COCs through treatment. Going forward, all aspects of the Selected Remedy will be the subject of operation and maintenance requirements to ensure the long-term effectiveness of the remedy.

2.10.4 - Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the preference for selecting remedial actions that use treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible encapsulation, or reduction of total volume of contaminated media.

Previous removal actions conducted by EPA at Site Q Central and Site Q South already have removed principal threat wastes by excavating and disposing off-Site approximately 3,271 drums and 14,000 tons of high-level PCB contaminated soil.

Implementation of the GMCS for the Sauget Area 2 interim groundwater remedy, which was designed to abate adverse impacts on the Mississippi River resulting from the discharge of groundwater contaminated from Sauget Area 1 and 2 sites and nearby facilities, has been effective in capturing and treating 98 percent of mass flux from impacted groundwater from the Sauget Area 2 Sites and 94 percent of the total plume mass flux from Sauget Area 1, Sauget Area 2, Clayton Chemical, and W.G. Krummrich facility which would have migrated into the Mississippi River without the GMCS.

For Site O, Alternative O3 provides treatment through phytotechnology to reduce the volume of constituents in Site O. However, after analysis, it was determined that not all Site O constituents are amenable to phytoremediation due to specific compounds in the waste material which are toxic to vegetation. Therefore, treatment through phytotechnology would not be effective in

reducing the volume of constituents in Site O and was not chosen to be part of the Selected Remedy.

For Site P, Alternative P3 includes the collection, removal, and off-Site treatment of NAPL from leachate well LEACH P-1, which is treatment to reduce the toxicity, mobility, and volume of this principal threat material.

For Site Q Central, Alternative QC3 includes soil vapor extraction (SVE) at a potential mobile source area. The SVE system would remove 5,000 to 8,000 pounds of chlorobenzene as well as an additional mass of 1,4 dichlorobenzene.

For Site Q South, Alternative QS2 and QS3 include the removal and off-Site disposal of intact drums at the AT-Q-35 location.

For Site S, Alternative S3 includes SVE over the entire area of Site S. The SVE system would remove approximately 62,000 to 99,000 pounds of VOCs from the soil.

The interim remedy already implemented, the GCMS, captures and treats an estimated 210 million gallons of contaminated groundwater a year from the Sauget Area 1 Sites G, H, and I South; W.G Krummrich facility; the former Clayton Chemical facility; and Sauget Area 2 Sites O, Q North, Q Dogleg, R, and S.

Through treatment, Alternatives O3, P3, QC3, QS2, QS3, and S3 will further reduce the toxicity, volume, or mobility of the hazardous constituents present in the impacted media at the Site.

2.10.5 - Short-term Effectiveness

This criterion examines the effectiveness of the alternatives in protecting human health and the environment during implementation of the cleanup until the cleanup is complete. It considers protection of the community, workers, and the environment during the cleanup.

Short-term risks associated with implementation of all of the action alternatives are typical of a construction project that involves construction of engineered covers. These risks include general risks to construction workers as well as risks to the community due to significant truck traffic needed to bring the large volume of fill and cover material to Sites O, P, Q, R, and S. Other risks include the potential for dust emissions or stormwater runoff from areas of affected soils or waste during construction of the covers.

The potential risks to the community due to dust emissions and stormwater runoff will be managed through fugitive dust and stormwater control measures that will be developed during remedial design. The potential risks to site workers during remedy implementation will be managed by requiring adequate personal protection equipment (PPE) and routine safety procedures that will be specified in a health and safety plan to be developed during remedial design.

2.10.6 - Implementability

This criterion assesses the technical and administrative feasibility of an alternative and the availability of required goods and services. Technical feasibility considers the ability to construct and operate a technology and its reliability, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of a remedy. Administrative feasibility considers the ability to obtain approvals from other parties or agencies and the extent of required coordination with other parties or agencies.

All of the action alternatives are possible to implement; however, the construction of RCRA Subtitle C covers poses extreme practical difficulties and regulatory obstacles. Construction of RCRA Subtitle C caps would significantly impact current business operations in the areas of Site Q North and Site Q Central. These areas are heavily used by multiple businesses and rely on movement of materials by rail, truck, and barge. Additionally, the construction of RCRA Subtitle C caps over Site Q North, Site Q Central, Site Q South, and Site R is not practicable from a regulatory standpoint, due to the lack of available land between the River and the levee from which to obtain borrow fill and meet a no net increase in flood potential in the area, in compliance with Illinois Department of Natural Resources floodplain requirements.

2.10.7 - Cost

This criterion evaluates the capital and operation and maintenance costs of each alternative. Present-worth costs are presented to help compare costs among alternatives with different implementation times.

The present worth costs for the alternatives are presented within the descriptions of alternatives in Section 2.9.2 of this ROD. The information in the cost estimate summary is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the remedial design phase. Major changes may be documented in the form of a memorandum in the Administrative Record file, and Explanation of Significant Differences (ESD), or a ROD amendment. The detailed cost estimates and associated assumptions for all alternatives are in the FS within the Administrative Record. The estimates are within a range of accuracy of +50 to -30 percent.

Table 41 in Section 2.10.9 provides a summary of the costs associated with each alternative.

2.10.8 - State/Support Agency Acceptance and Community Acceptance

State/support agency acceptance considers the state's preferences among or concerns about the alternatives, including comments on regulatory criteria or proposed use of waivers. Community acceptance considers the community's preferences or concerns about the alternatives.

The State of Illinois supports the selection of Alternatives O2, P3, QN2, QC3, QS3, R2, and S3 as the Selected Remedy. It is expected that the State will provide a concurrence letter in the near future.

During the public comment period, the community expressed no adverse opinions applying to the actions required by the Selected Remedy (Alternatives O2, P3, QN2, QC3, QS3, R2, and S3). A complete list of the public comments and EPA's response to the comments is contained in the *Responsiveness Summary*, which is Part 3 of this ROD. In addition, the transcript from the Proposed Plan public meeting is included in the Administrative Record.

2.10.9 – Comparative Analysis Summary

Table 41 provides a summary of the comparative analysis of the alternatives described in Sections 2.10.1 through 2.10.8, above. The alternative highlighted in grey is the Selected Remedy.

Table 41: Comparative Analysis Summary Table

Alternative	Meets RAOs	Meets Threshold Evaluation Criteria		Time to Implement (Yrs)	Estimated 30-Year Present Worth Cost
		Overall Protection	Compliance with ARARS		
Alternative O1: No Action	☐	☐	☐	0	$0
Alternative O2: 35 IAC § 724 Compliant Soil Cover Over Identified Waste Areas and Institutional and Access Controls	☑	☑	☑	6 - 9	$6.3M
Alternative O3: Phytotechnology in Potential Mobile Source Areas, 35 IAC § 724 Compliant Soil Cover Over Remainder of Identified Waste Areas, and Institutional and Access Controls	☑	☑	☑	6 -9	$5.8M
Alternative O4: RCRA Subtitle C Designed Cover Over Identified Waste Areas and Institutional and Access Controls	☑	☑	☑	7-11	$16.2M
Alternative P1: No Action	☐	☐	☐	0	$0
Alternative P2: Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cover Over Remainder of Identified Waste Areas, Vapor	☑	☑	☑	5 - 8	$2.6M

Table 41: Comparative Analysis Summary Table					
Alternative	Meets RAOs	Meets Threshold Evaluation Criteria: Overall Protection	Meets Threshold Evaluation Criteria: Compliance with ARARS	Time to Implement (Yrs)	Estimated 30-Year Present Worth Cost
Intrusion Mitigation and Institutional and Access Controls					
Alternative P3: NAPL Collection at Well (LEACH P-1), Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cover Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation and Institutional and Access Controls	☑	☑	☑	5 -8	$2.9M
Alternative P4: Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5), RCRA Subtitle C Cover Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation and Institutional and Access Controls	☑	☑	☑	6 - 9	$5.2M
Alternative QN1: No Action	☐	☐	☐	0	$0
Alternative QN2: 35 IAC § 724 Compliant Crushed Rock Cover Over Dogleg Area, Vapor Intrusion Mitigation, and Institutional and Access Controls	☑	☑	☑	5 -8	$1.3M
Alternative QN3: RCRA Subtitle C Designed Cover Over Dogleg Area, Vapor Intrusion Mitigation, Institutional and Access Controls	☑	☑	☐	7 - 11	$12.8M
Alternative QN4: RCRA Subtitle C Designed Cover Over Identified Waste Areas, Vapor Intrusion Mitigation, and Institutional and	☑	☑	☐	10 - 14	$33.4M

Table 41: Comparative Analysis Summary Table					
Alternative	Meets RAOs	Meets Threshold Evaluation Criteria: Overall Protection	Meets Threshold Evaluation Criteria: Compliance with ARARS	Time to Implement (Yrs)	Estimated 30-Year Present Worth Cost
Access Controls					
Alternative QN5: 35 IAC § 724 Compliant Crushed Rock Cover Over Identified Waste Areas, Vapor Intrusion Mitigation, and Institutional and Access Controls	☑	☑	☑	6 - 9	$3.1M
Alternative QC1: No Action	☐	☐	☐	0	$0
Alternative QC2: 35 IAC § 724 Compliant Crushed Rock Cover Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls	☑	☑	☑	6 - 9	$2.1M
Alternative QC3: SVE at Mobile Source Area (AT-Q32), 35 IAC § 724 Compliant Crushed Rock Cover Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls	☑	☑	☑	6 - 9	$2.8M
Alternative QC4: RCRA Subtitle C Designed Cover Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls	☑	☑	☐	10 -15	$39.5M
Alternative QS1: No Action	☐	☐	☐	0	$0
Alternative QS2: Removal of Intact Drums at AT-Q35, 35 IAC § 724 Compliant Cover Over Identified Risk Areas, and	☑	☑	☑	5-8	$2.0M

Table 41: Comparative Analysis Summary Table					
		Meets Threshold Evaluation Criteria			
Alternative	Meets RAOs	Overall Protection	Compliance with ARARS	Time to Implement (Yrs)	Estimated 30-Year Present Worth Cost
Institutional and Access Controls					
Alternative QS3: Removal of Intact Drums at AT-Q35, 35 IAC § 724 Compliant Cover Over Identified Waste Areas, and Institutional and Access Controls	☑	☑	☑	5 - 9	$4.5M
Alternative QS4: RCRA Subtitle C Designed Over Identified Waste Areas, and Institutional and Access Controls	☑	☑	☐	8 -12	$8.7M
Alternative R1: No Action	☐	☐	☐	0	$0
Alternative R2: 35 IAC § 724 Compliant Soil Cover Over Entire Site and Institutional and Access Controls	☑	☑	☑	6 - 9	$2.0M
Alternative R3: RCRA Subtitle C Designed Cover Over Entire Site and Institutional and Access Controls	☑	☑	☐	8 - 11	$9.2M
Alternative S1: No Action	☐	☐	☐	0	$0
Alternative S2: 35 IAC § 724 Compliant Soil Cover Over Entire Site and Institutional and Access Controls	☑	☑	☑	4 - 7	$0.32M
Alternative S3: In-Situ Treatment with SVE of Mobile Source Area, 35 IAC § 724 Compliant Soil Cover Over Entire Site and Institutional and Access Controls	☑	☑	☑	5 - 8	$1.0M
Alternative S4: RCRA Subtitle C	☑	☑	☑	5 - 9	$0.67M

Table 41: Comparative Analysis Summary Table					
Alternative	Meets RAOs	Meets Threshold Evaluation Criteria		Time to Implement (Yrs)	Estimated 30-Year Present Worth Cost
		Overall Protection	Compliance with ARARS		
Designed Cover Over Entire Site and Institutional and Access Controls					

2.11 – Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site, wherever practicable (see 40 CFR § 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or will present a significant risk to human health or the environment should exposure occur. Conversely, low-level threat wastes are those source materials that generally can be reliably contained and that will present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

Wastes that generally will be considered to constitute principal threats include but are not limited to the following:

- **Liquid source material** - wastes contained in drums, lagoons or tanks, or free product in the subsurface (i.e., non-aqueous phase liquids) containing contaminants of concern (generally excluding groundwater).

- **Mobile source material** - surface soil or subsurface soil containing high concentrations of chemicals of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., volatile organic compounds), surface runoff, or subsurface transport.

- **Highly toxic source material** - buried, drummed non-liquid wastes; buried tanks containing non-liquid wastes; or soils containing significant concentrations of highly toxic materials.

Wastes that generally will not constitute principal threats include but are not limited to the following:

- **Non-mobile contaminated source material of low to moderate toxicity** - surface soil containing chemicals of concern that generally are relatively immobile in air or

groundwater (i.e., non-liquid, low volatility, low leachability contaminants such as high molecular weight compounds) in the specific environmental setting.

• **Low toxicity source material** - soil and subsurface soil concentrations not greatly above reference dose levels or that present an excess cancer risk near the acceptable risk range if exposure were to occur.

To protect human health and the environment, a combination of methods would be used to address the principal threat wastes observed at Site P, Q North, Q South, and R. Small quantities of principal threat wastes were observed in the following locations: Site P, NAPL observed in Trench AT-P-4 and well LEACH P-1; Site Q North, NAPL was observed at Sonic-5 and well LEACH-Q-1; Site Q South, two intact drums were found where potential NAPL leaked into the trench from the drums; and Site R, NAPL was observed at eight locations in Site R. Alternatives P3, QS2, and QS3 address the areas on Sites P and Q South by treating the recovered NAPL from Site P by off-Site incineration and removal and off-Site disposal of intact drums located on Site Q South. The NAPL identified on Site Q North and Site R are captured and treated by the GMCS.

To address the remaining low-level threat waste, engineering controls[20] in the form of engineered covers will be used to eliminate the direct contact exposure pathway. Engineered covers meeting the requirements of 35 IAC § 724 compliant caps will be installed over Sites O, Q North, Q Central, Q South, R, and S; and 35 IAC § 807 caps will be installed over Site P.

2.12 – Selected Remedy

The Selected Remedy for OU1 of the Sauget Area 2 Site, in addition to the continued operation of the GCMS, consists of the following alternatives:

- Selected Alternative for Site O and O North: Alternative O2: 35 IAC § 724 Compliant Soil Cap Over Identified Waste Areas and Institutional and Access Controls;
- Selected Alternative for Site P: Alternative P3: Collection, Treatment, and Off-Site Disposal of NAPL at Well (LEACH P-1), Asphalt Cap over Potentially Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Selected Alternative for Site Q North: Alternative QN2: 35 IAC § 724 Compliant Crushed Rock Cap Over Dogleg Area, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Selected Alternative for Site Q Central: Alternative QC3: SVE at Potentially Mobile Source Area (AT-Q32), 35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls;

[20] Engineering controls encompass a variety of engineered and constructed physical barriers (e.g., soil capping, sub-surface venting systems, mitigation barriers, fences) to contain and/or prevent exposure to contamination on a property.

- Selected Alternative for Site Q South and Q South Ponds: Alternative QS3: Removal of Intact Drums at AT-Q35, 35 IAC § 724 Compliant Cap Over Identified Waste Areas, and Institutional and Access Controls;
- Selected Alternative for Site R: Alternative R2: 35 IAC § 724 Compliant Soil Cap Over Entire Site, and Institutional and Access Controls; and
- Selected Alternative for Site S: Alternative S3: In-Situ SVE of Potentially Mobile Source Area, 35 IAC § 724 Compliant Soil Cap Over Entire Site, and Institutional and Access Controls.

Summary of the Rationale for the Selected Remedy

The Selected Alternatives (O2, P3, QN2, QC3, QS3, R2, and S3), in conjunction with the continued operation of the GCMS, were selected over other alternatives because they are expected to achieve substantial and long-term risk reduction through treatment, expected to prevent future exposure to currently contaminated soils and groundwater, and expected to allow the property to be used for the reasonably anticipated future land use, which is industrial.

The Selected Remedy will address the significant sources of on-going contamination to groundwater through recovery, treatment and off-Site disposal of NAPL pumped from Site P, removal and off-Site disposal of intact drums located on Site Q South, and treatment of potentially mobile source areas through in-site treatment through soil vapor extraction at Site Q Central.

Based on the information collected and studied in the RI/FS conducted for the Site, EPA and the State of Illinois believe the selected remedy will be: (1) protective of human health and the environment, (2) comply with ARARs, (3) be cost-effective, and (4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Because it will treat the source materials constituting principal threats, the remedy also meets the statutory preference for the selection of a remedy that involves treatment as a principal element.

Description of the Protectiveness Achieved by the Selected Remedy

The Selected Remedy achieves protectiveness by off-Site incineration of the NAPL recovered from Site P and removal and off-Site treatment and disposal of intact drums at Site Q South, plus in-situ treatment through soil vapor extraction at Site Q Central. The Selected Remedy provides a significantly higher degree of treatment compared to the other alternatives. Engineering controls will be used to address the remaining low-level threat waste by eliminating the direct contact exposure pathway. Engineered caps meeting the requirements of 35 IAC § 724 compliant caps will be installed over Sites O, Q North, Q Central, Q South, R, and S. Engineered caps meeting the requirements of 35 IAC § 807 will be installed over specific areas of Site P.

Summary of the Estimated Remedy Costs

The estimated cost of implementing the Selected Remedy for the Sauget Area 2 Site, OU1 is $20.8 million. A detailed cost estimate for the Selected Remedy, Alternatives O2, P3, QN2, QC3, QS3, R2, and S3, is included as Appendix C. The cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data that will be collected during the remedial design phase. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Expected Outcome of the Selected Remedy

The expected outcome of the Selected Remedy is that potential receptors in Sauget Area 2 Sites will no longer be exposed to soil or groundwater source areas that pose a threat to human health or the environment. The land use of the properties within the Site will remain unchanged.

2.13 – Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

In conjunction with the continued operation of the GCMS, implementation of the Selected Remedy, Alternatives O2, P3, QN2, QC3, QS3, R2, and S3, will be protective of human health and the environment through the off-Site incineration of the NAPL recovered from Site P; removal and off-Site treatment and disposal of intact drums at Site Q South; in-situ treatment with SVE at Site Q Central and Site S; elimination of the direct contact exposure pathway through installation of 35 IAC § 724 compliant caps at Sites O, Q North, Q Central, Q South, Site R, and Site S, and installation of 35 IAC § 807 compliant caps at Site P; and placement and enforcement of institutional and access controls at all of the Area 2 sites.

The Site-specific RAOs were developed to protect current and future receptors that are potentially at risk from exposure to the soil and groundwater source contaminants at OU1. The Selected Remedy will achieve the RAOs. Additionally, institutional and access controls will be employed at Sites O and O North, P, Q North, Q Central, Q South, R, and S in order to ensure that the remedy remains protective.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. Appendix B provides a list of all ARARs that have been identified for the remedial action. The Selected Remedy will comply with the identified ARARs.

Cost-Effectiveness

EPA has concluded that the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (see 40 CFR Section 300.430(f)(1)(ii)(D)). This determination was made by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of the Selected Remedy was determined to be proportional to its costs. The Selected Remedy therefore represents a reasonable value for the money to be spent.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

EPA has determined that the Selected Remedy for OU1 represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-Site disposal, and considering state and community acceptance. The Selected Remedy includes off-Site incineration of the NAPL recovered from Site P and removal and off-Site treatment and disposal of intact drums from Site Q South, plus in-situ treatment through soil vapor extraction at Site Q Central. To address the remaining low-level threat waste and to eliminate the direct contact exposure pathway, engineering controls will be used. Engineered caps meeting the requirements of 35 IAC § 724 will be installed over Sites O, Q North, Q Central, Q South, Site R, and S; and 35 IAC § 807 compliant caps will be installed over Site P.

The Selected Remedy therefore provides a permanent solution for both the low-level and principal threat wastes at OU1 that is effective in the long term and achieves significant reductions in contaminant mass flux to groundwater through treatment of source areas and containment of wastes.

Preference for Treatment as a Principal Element

In addition to the capture and treatment of contaminated groundwater and NAPL by virtue of the GCMS, the Selected Remedy will treat NAPL through off-Site incineration of the recovered NAPL from Site P and removal and off-Site treatment and disposal of intact drums from Site Q South, and will treat contaminants in-situ with SVE at Site Q Central. The Selected Remedy provides a significantly higher degree of treatment compared to the other alternatives. By utilizing treatment as a portion of the remedy, the Selected Remedy satisfies to the maximum extent practicable the statutory preference for remedies that employ treatment as a principal element.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-Site, at depth but above levels that allow for unlimited use and unrestricted exposure, EPA will conduct a statutory review within five years after initiation of the remedial action and every five years subsequent, to ensure that the remedy is, or will be, protective of human health and the environment.

2.14 – Documentation of Significant Changes

The Proposed Plan for OU1 was released for public comment on June 7, 2013. The Proposed Plan identified the following as the preferred alternatives:

- Selected Alternative for Site O and O North: Alternative O2: 35 IAC § 724 Compliant Soil Cap Over Identified Waste Areas and Institutional and Access Controls;
- Selected Alternative for Site P: Alternative P3: Collection, Treatment, and Off-Site Disposal of NAPL at Well (LEACH P-1), Asphalt Cap over Potentially Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Selected Alternative for Site Q North: Alternative QN2: 35 IAC § 724 Compliant Crushed Rock Cap Over Dogleg Area, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Selected Alternative for Site Q Central: Alternative QC3: SVE at Potentially Mobile Source Area (AT-Q32), 35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls;
- Selected Alternative for Site Q South and Q South Ponds: Alternative QS3: Removal of Intact Drums at AT-Q35, 35 IAC § 724 Compliant Cap Over Identified Waste Areas, and Institutional and Access Controls;
- Selected Alternative for Site R: Alternative R2: 35 IAC § 724 Compliant Soil Cap Over Entire Site, and Institutional and Access Controls; and

- Selected Alternative for Site S: Alternative S3: In-Situ SVE of Potentially Mobile Source Area, 35 IAC § 724 Compliant Soil Cap Over Entire Site, and Institutional and Access Controls.

After carefully reviewing all written and verbal comments submitted during the public comment period, EPA has determined that no significant changes to the remedy as originally identified in the Proposed Plan are necessary or appropriate.

Part 3 – Responsiveness Summary

The Proposed Plan for the Sauget Area 2 Site was released for public comment on June 7, 2013. EPA held a public meeting in Cahokia, Illinois on June 12, 2013, to describe the Proposed Plan and answer questions about the different cleanup alternatives. The public meeting also provided the community with an opportunity to comment on the proposed cleanup alternative and the other alternatives evaluated. EPA received one lengthy comment at the public meeting. No written comments were received during the public comment period. The comment was subdivided so that responses could be more easily understood.

3.1 – Stakeholder Comments and Lead Agency Responses

Comment: The commenter stated on all sites EPA lists a "no action" alternative, but failed to list a "remove wastes from the floodplain" alternative. Given the nature of the site in the floodplain and given the vulnerability of the levees and climate change impacts, the commenter strongly urged EPA to include alternatives for the removal of all waste in the floodplain.

> **Response**: Alternatives that remove all soil and wastes with contamination were not considered technically or economically feasible as a result of the excessive excavation depths and the risks to workers and the community from such a massive excavation and disposal project. Further confirming this judgment is the fact that most of the waste from the various sites in Area 2 is located under the area groundwater table.

Comment (continued): The commenter asked how covering the contaminants in place rather than removing them entirely from the floodplain satisfy the Superfund evaluation criteria for long term effectiveness and permanence?

> **Response**: See the response to the previous comment: excavation and removal of the waste, and its subsequent transport and disposal elsewhere (e.g., the permanent remedy), is not a viable alternative given the wastes' magnitude and location under the water table in Area 2. The evaluation of long-term effectiveness and permanence of the cover alternatives is presented in the feasibility study Section 5.3. In general, the Selected Alternatives are considered to be effective in the long-term because the risks to human health and the environment following implementation are small and the potential for uncontrolled migration of wastes is minimal. Going forward, the remedies will be properly implemented and maintained to retain their effectiveness.

Comment (continued): The commenter stated there have been several sand boils in the Metro East levee system and the levee system is designed to protect the Sauget/Cahokia/East St. Louis area from the Mississippi River and asked the following: 1.) has EPA taken into account the present condition of the levee system with the Selected Alternatives, 2.) has EPA taken into account climate change, more intense rainfall, and snow storms resulting in higher river levels and their impacts on levees in choosing the Selected Alternatives.

Response: The U.S. Army Corps of Engineer's levee project is absolutely necessary to protect the people living in the surrounding area during a significant flooding event. EPA's analysis has tried to take into account the present and future condition of the levee, and future Site conditions. However, flooding from the Mississippi River and the effects from flooding cannot be prevented, but only mitigated to the extent possible given the location of the Site. The potential for failure of the levees would potentially affect Sites O, P, and S, while Sites Q and R are on the River side of the levees. However, large areas of principal threat waste are not found at Sites O, P, and S. The recommended alternatives for all three sites include engineered soil covers. These covers will provide additional protection from erosion of waste materials from these sites if the levees were to fail. Going forward, all remedies will be properly implemented, operated and maintained. Should a remedy be damaged or adversely affected by flooding, additional appropriate response measures will be implemented to ensure ongoing protectiveness.

Comment (continued): The commenter stated there are a number of relief wells proposed in the stretch from East St. Louis through Sauget and Cahokia. This has the potential to bring up DNAPLs to the surface, which totally negates all EPA's proposed alternatives. Despite EPA's plans to keep the contaminants in place and eliminate exposure to humans and wildlife, those efforts will be undone by the breaking up of contaminants in the groundwater. Additionally, how will the contamination brought to the surface by the levee repair project relief wells be managed?

Response: EPA is aware of the Corps of Engineers plans to use relief wells for levee protection. The levee wells will be unlikely to recover DNAPL because DNAPL was not encountered in close proximity to the levee (see RI Figure 5-26). Also, where DNAPL was encountered, it was not extensive and was residualized within the soil matrix where its mobility is limited. We believe that the levee project will make levee failure a far less likely eventuality. Aspects of the repair project, however, may lead to some pollutant discharges. Specifically, it is recognized that operation of the wells, may draw dissolved phase contamination in groundwater to the surface. However, the consequences of a levee failure would potentially result in much more serious and widespread environmental damage than the preventative measures called for in the operation of the levee wells.

Additionally, the levee repair relief wells will convey existing groundwater passively and not by pumping of the relief wells. According to the information provided by the Southwestern Illinois Flood Prevention District (SWIFPD) and the Illinois EPA's Bureau of Water (BOW) review of the Clean Water Act (CWA) Section 401 water quality certification application for its portion of the levee projects, the Mississippi River (River) is hydraulically connected to the adjoining alluvial aquifer system that comprises the

American Bottoms. When the River is not at flood stage, adjoining groundwater within the American Bottoms alluvial aquifer and surface water runoff naturally discharges to the River. This is a normal hydrologic process, unaffected by human activity. When the River elevation rises, hydrogeologic conditions change, and the River charges the adjoining aquifer and groundwater flow direction and gradients are reversed. In the presence of the existing levee, the same groundwater – hydraulically connected to a rising River – moves upwards toward the ground surface. This groundwater will move under, and sometimes through the levee as uncontrolled seepage and/or through sand boils, discharging to low areas such as sloughs, ponds and lakes, and drainage channels. This discharge of flood-induced groundwater to the surface has occurred throughout time, even in the absence of levee relief structures. This uncontrolled groundwater seepage flows as surface water back to the River. Under the above described basic hydrologic conditions, the levee improvement project by SWIFPD will not affect or change quality of water already discharging to the River. The groundwater (including all the groundwater constituents) discharges to the River now, has done so in the past, and will continue to reach the River with or without the implementation of the proposed levee project.

Naturally occurring metals (e.g. iron, manganese) are widespread throughout the American Bottoms aquifer, making a distinction between areas with metal concentrations of natural or man-made origin difficult. Groundwater concentrations of these metals are often found to be higher than associated surface waters given the interaction of groundwater with geological materials. It is expected that relief structure upwelling and subsequent pump station discharges would contain naturally occurring groundwater metals at concentrations that may be slightly higher than that of the streams and wetlands that would receive pump station discharges. However, the concentrations of these metals conveyed through relief structures is no different than the concentrations that would be found in uncontrolled upwelling that would occur in the absence of relief structures. For the SWIFPD project, naturally occurring concentrations of metals in pump station discharges would not result in surface water quality standard violations once discharged, as pump station discharges are intermittent in nature and only occur during flood conditions when mixing with floodwaters would allow for attainment of water quality standards.

The BOW reviewed groundwater sampling data, including metals, VOCs, and SVOCs, from wells near Sauget Area 2. According to the June 2008 EPA report entitled "First Five-Year Review Report, Sauget Area 2 Superfund Site, Sauget, Illinois" there are three distinct vertical stratification layers of total VOCs and total SVOCs concentrations at Site R, with concentrations decreasing with depth. The BOW also reviewed groundwater data that corroborates this information (i.e., shallower wells had higher concentrations of parameters while deeper wells had lower amounts). The proposed relief wells by SWIFPD will be screened at a depth of 63 to 94 feet, which corresponds with the deepest stratification layer. The applicant provided water quality information representative of the water at the depth of the water that will be discharged through relief structures. Groundwater that is passively conveyed from relief structures in this area would be discharged to the East St. Louis pump station and would be discharged directly into the

Mississippi River. Given the low concentrations of VOCs and SVOCs detected in well sampling from this area, and the large watershed area of the East St. Louis pump station, the BOW has determined that, for the SWIFPD project, discharges from this pump station will meet water quality standards. However, for the SWIFPD project, in the unexpected event that concentrations of these pollutants in pump station discharges are above water quality standards/criteria, mixing within the Mississippi River is anticipated to ensure compliance with these standards.

The CWA Section 401 water quality certification application for the Corps of Engineers portion of the levee repairs is currently under review by the BOW.

Comment (continued): The commenter expressed appreciation for EPA's proposal to restrict future access to the sites, but the groundwater pumping from the IDOT wells negates that restriction. The Southwestern Illinois Flood Prevention District plan is to repair the levees to get 100 year certification from the Federal Emergency Management Agency (FEMA) and the Corps so that development can continue in the floodplain. The Corps did not consider climate change in its equation to determine a 100 year event. Some scientists have suggested that the 100 year event is really just a seven year event. Getting certification by FEMA is expected by 2015. It could be many more years before the Corps has funding to repair the levees to the authorized level of protection said by the Corps variously to be a 500-year level or a 350-year level. Development in the floodplain will cause increased interior flooding, which will impact the Sauget area sites, and cause increased water on the landward side of the levee, coupled with higher river levels on the other side of the levee that will put the levees protecting the American Bottom at severe risk. In addition, we are in the New Madrid seismic zone and the area is at risk for severe liquefaction. Our levees were built on sand and not built to withstand an earthquake. Scientists say the New Madrid is due for a major event. Has EPA considered the potential for earthquakes and levee failure in the risk assessments or in choosing the Selected Alternatives?

Response: Specific recognition of the impact of earthquakes and levee failure on releases from the sites was in the form of taking into account the fact that the Sauget Area 2 Site is potentially prone to being saturated in water. Fortunately, the Sites protected by the levee (e.g., on the dry side of the levee), Sites O, P, and S, do not contain large areas of principal threat waste. In any case, the Selected Remedy's engineered caps for these sites will reduce the potential for release of contaminants to the environment if the levees were to fail. However, under any possible approach, flooding from the Mississippi River and the effects from flooding, or similarly, earthquake, cannot be prevented, but only mitigated to the extent possible given the location of the Site. Going forward, all remedies will be properly implemented, operated and maintained. Should a remedy be damaged or adversely affected by any event, response measures will be taken to ensure ongoing protectiveness.

Comment (continued): The commenter stated the Illinois EPA has already granted the Flood Prevention District Council (FPDC) a CWA Section 401 permit that allows the levee districts to pump groundwater from relief wells untreated into the river, including the Sauget Superfund area. Any treatment of water from relief wells in this area should be paid for by the PRPs of Sauget Areas 1 and 2 rather than by the levee districts and taxpayers. In addition, any barrier walls constructed by the Corps or the FPDC in the area of Sauget Areas 1and 2 should be funded

by the PRPs, not taxpayers. They have caused the contamination and must bear the costs of dealing with the contaminants.

> **Response**: See response above regarding the Illinois EPA's review of the CWA Section 401 water quality certification application. Sauget Area PRPs have funded or paid for all of the response actions that have taken place in Sauget Areas 1 and 2, including the construction of GCMS, and will continue to fund all required operation and maintenance activities associated with these response actions into the future.

Comment (continued): The commenter stated the risk assessments look at the different ways people may be exposed and then determine the potential health risks. Was a risk assessment performed to look at the potential of a levee breach?

> **Response**: The potential for a levee breach emphasizes the need for the U.S. Army Corps of Engineer's levee project to minimize the risk of a breach. However, an in-depth assessment would not likely be meaningful because the alternative of removal is not viable, as discussed above. The Selected Remedy's engineered caps will reduce the potential for release of contaminants to the environment if the levees were to fail. In the event of a levee breech, the sites would be evaluated for the occurrence of erosion of the capping remedy and/or new or different potential risks from the release or possible release of wastes. If erosion and/or new risks from the release of waste were found, further investigation would be performed, along with evaluation and implementation of required repair or additional necessary response action.

Comment (continued): The commenter stated flood water carrying contaminants and perhaps scouring covered landfills could expose residents in Sauget and Cahokia to toxic waters. The contaminated flood water would also be carried downstream to other communities and in to water supplies and asked why EPA didn't determine natural resource damages before selecting cleanup alternatives?

> **Response**: The potential for floodwaters scouring the landfills and causing a release to the river was evaluated and the results of the evaluation are documented in the Feasibility Study *Attachment 5, "Quantitative Analysis of Flood Velocities for Superfund Sites R and Q."* The conclusion of the study was that flood velocities were not high enough to result in scouring of soil or waste. Under CERCLA, natural resource damages (NRD) relief is not part of the remedy selected by EPA. The potentially responsible parties work directly with natural resource trustees to resolve liability associated with NRD.

Comment (continued): The commenter stated number three of the evaluation criteria for superfund cleanup alternatives is long term effectiveness and permanence. How will the contamination be managed in the event of a levee breach?

> **Response**: In the event of a levee breech, the sites would be evaluated for the occurrence of erosion of the capping remedy and the release or possible release of wastes. If erosion and/or the release of waste were found to have occurred, further investigation of the extent and deposition of the waste would be performed, along with evaluation, and implementation, of additional necessary response measures, or repair of the existing remedy.

Comment (continued): The commenter asked how will the contamination be managed in the event of an earthquake?

> **Response**: In the event of an earthquake of significant magnitude, a visual inspection of the sites, at a minimum, would be performed. In addition, data from groundwater monitoring wells could be evaluated to determine any adverse effects from an earthquake. Adverse impacts on the remedy components would be analyzed, along with evaluation and implementation of additional remedial alternatives, and/or repair, as needed.

Comment (continued): The commenter requested that questions and answers from the question and answer period be part of the official record.

> **Response**: A transcript of the questions posed during the presentation of information along with the answers given is included in the EPA's file and is part of the Administrative Record for the Sauget Area 2 Site.

Comment (continued): The commenter thanked all the agencies who have worked so hard for so long on these sites. The commenter continued to state how complex the site is, how horrific the contamination is and how difficult the decisions are, but the decisions EPA makes could have grave impacts upon the people of our communities, on those living downstream, on the fish and wildlife and the eco system. Additionally, the commenter stated those who have caused this contamination must be made to pay to clean it up and you must not allow the levee repair project to undo the safeguards EPA is trying to put in, otherwise all the work is for naught.

> **Response:** EPA appreciates the thanks and will continue to inform the public as we move through design and construction of the Selected Remedy. EPA agrees with the commenter that Sauget Area 2 Site is complex. The magnitude of the Site's waste, over 4.5 million cubic yards, and the Site's location next to the River present very difficult challenges and EPA is doing its best under the authorities that are available under CERCLA. Sauget Area PRPs have cooperated with the State and federal efforts to address contamination in Areas 1 and 2. PRPs have either conducted, with EPA oversight, the investigatory and remedial measures taken on the Sauget Area 1 and 2 Sites so far, or have paid EPA for its costs in response actions it has taken. The PRPs have also paid for EPA and IEPA oversight costs expended in overseeing the conduct of administrative orders, agreements on consent, and consent decrees issued or entered for the Sites.

FIGURES

Figure 1: Sauget Area 2 Sites

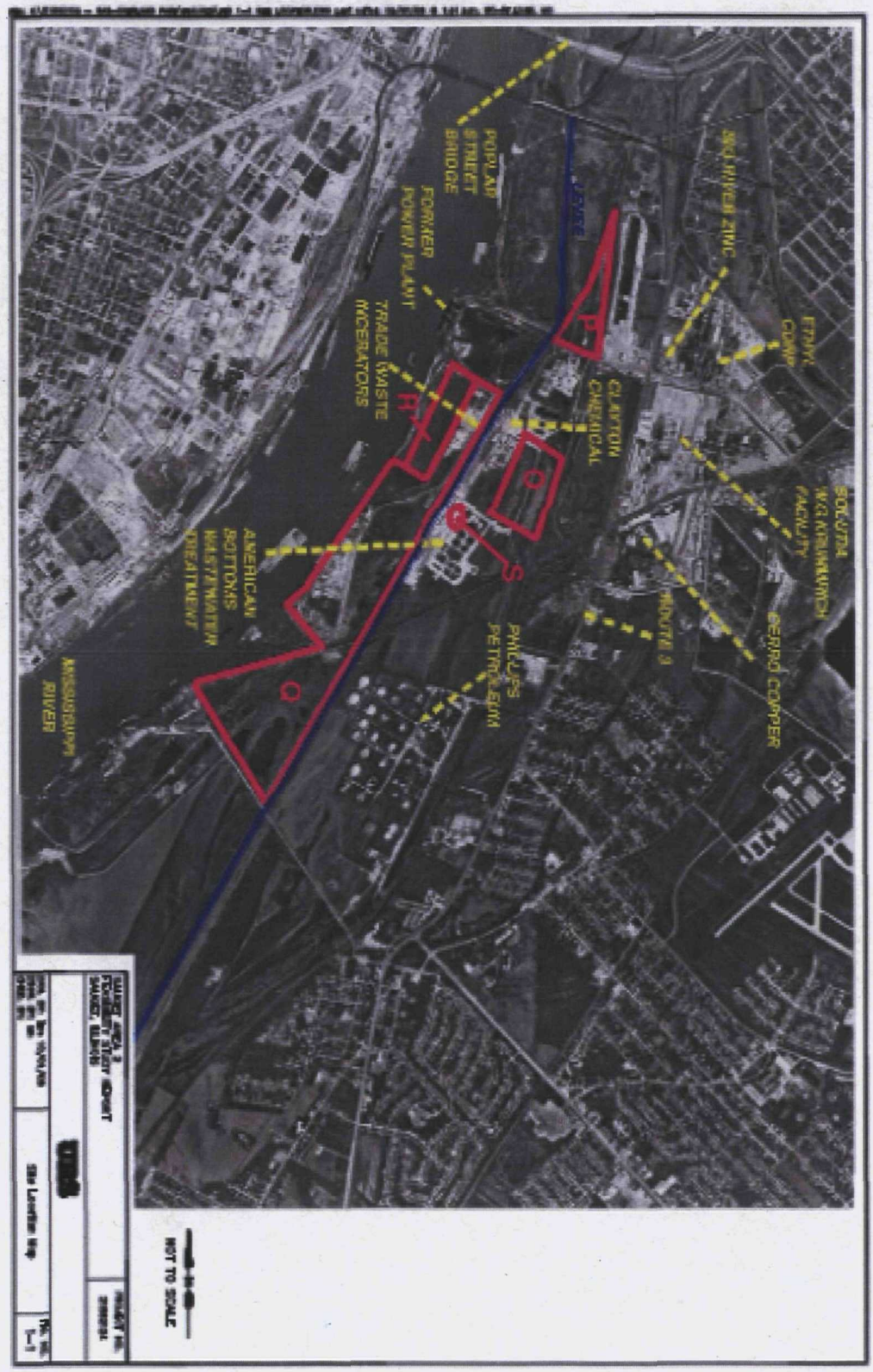


Figure 2: Conceptual Site Model

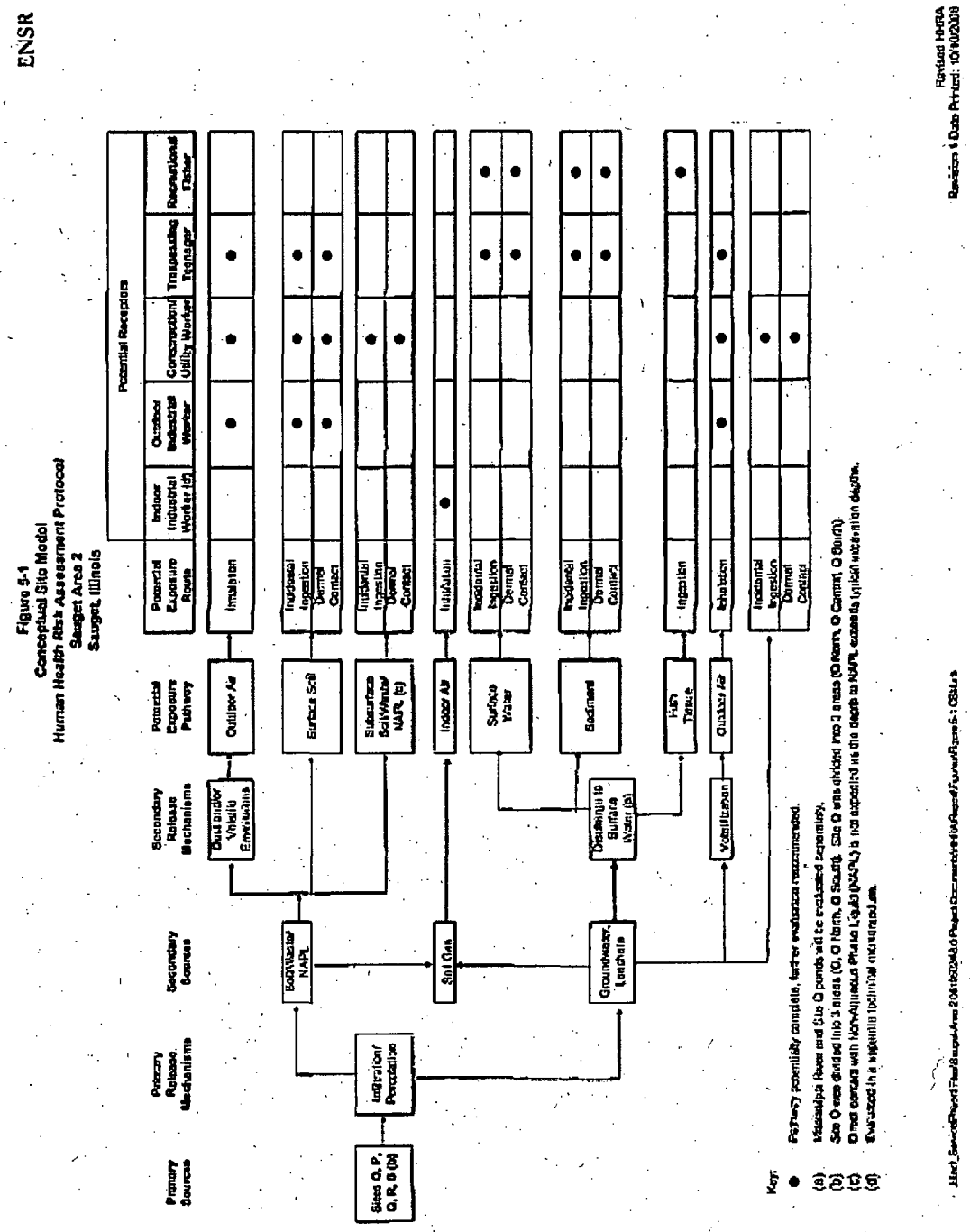


Figure 3: Generalized Geologic Cross Section

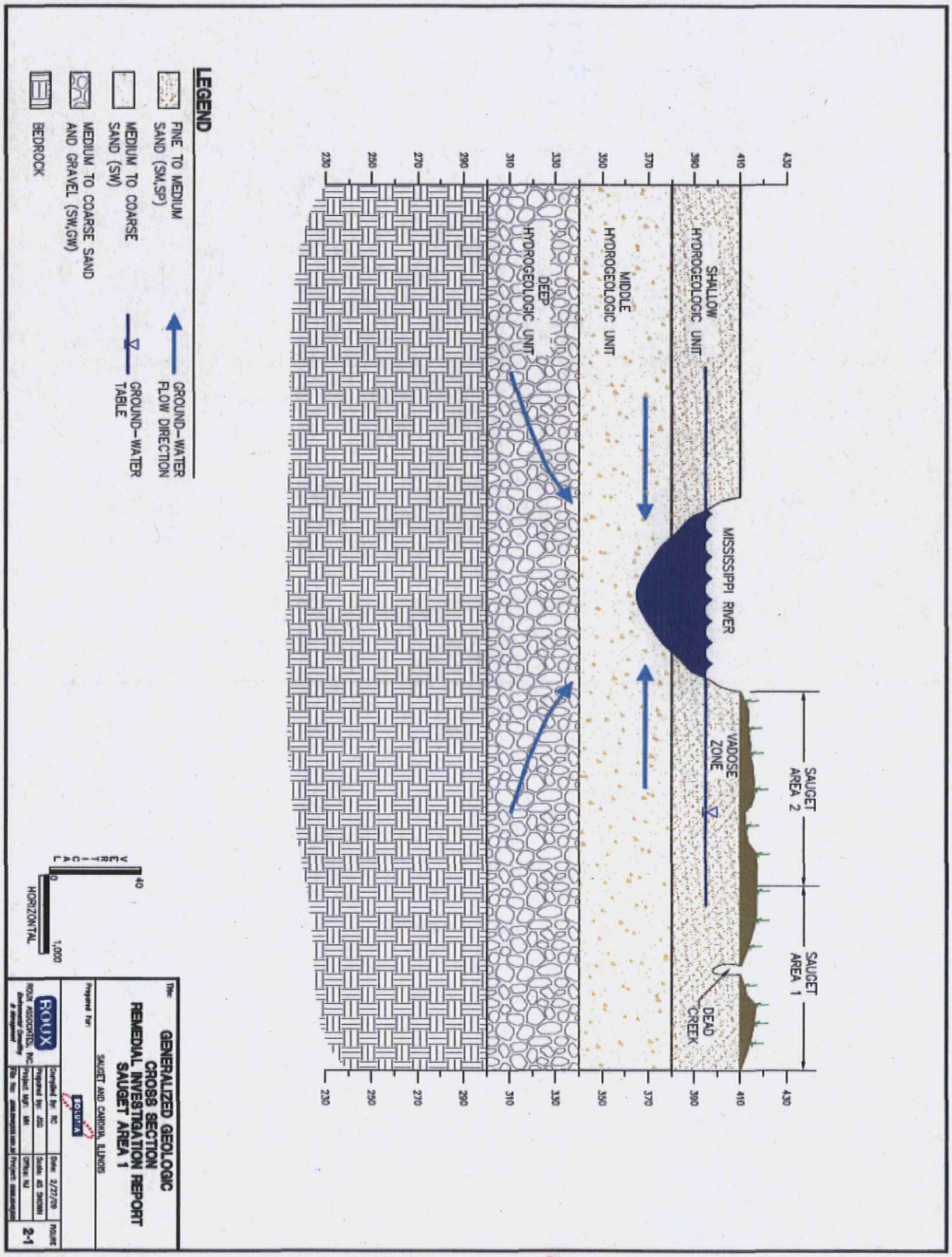


Figure 4: Site O: Alternatives O2/O4

Figure 5: Site O: Alternative O3

Figure 6: Site P: Alternatives P2, P3, P4

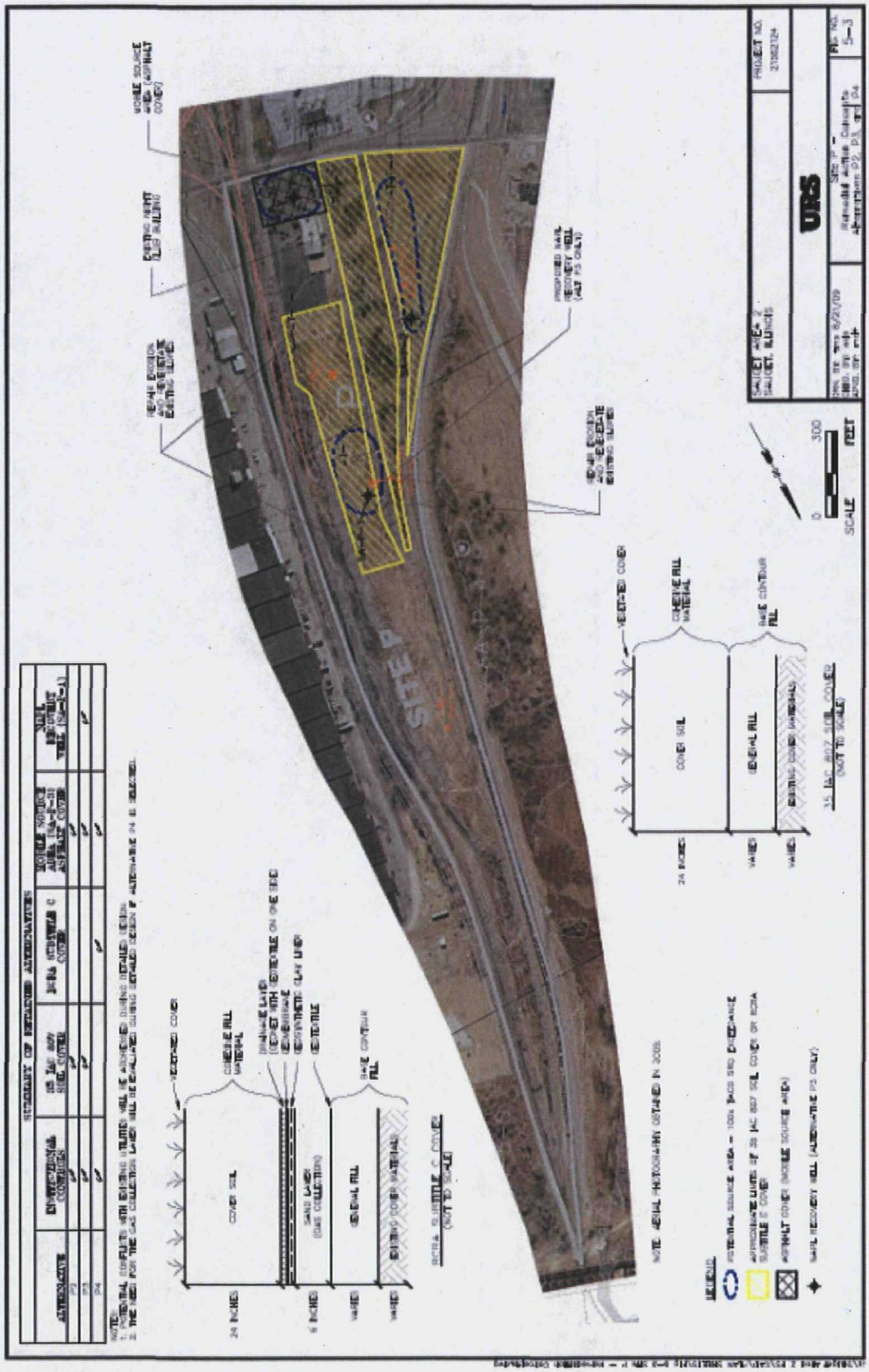


Figure 7: Site Q North: Alternatives QN2/QN3

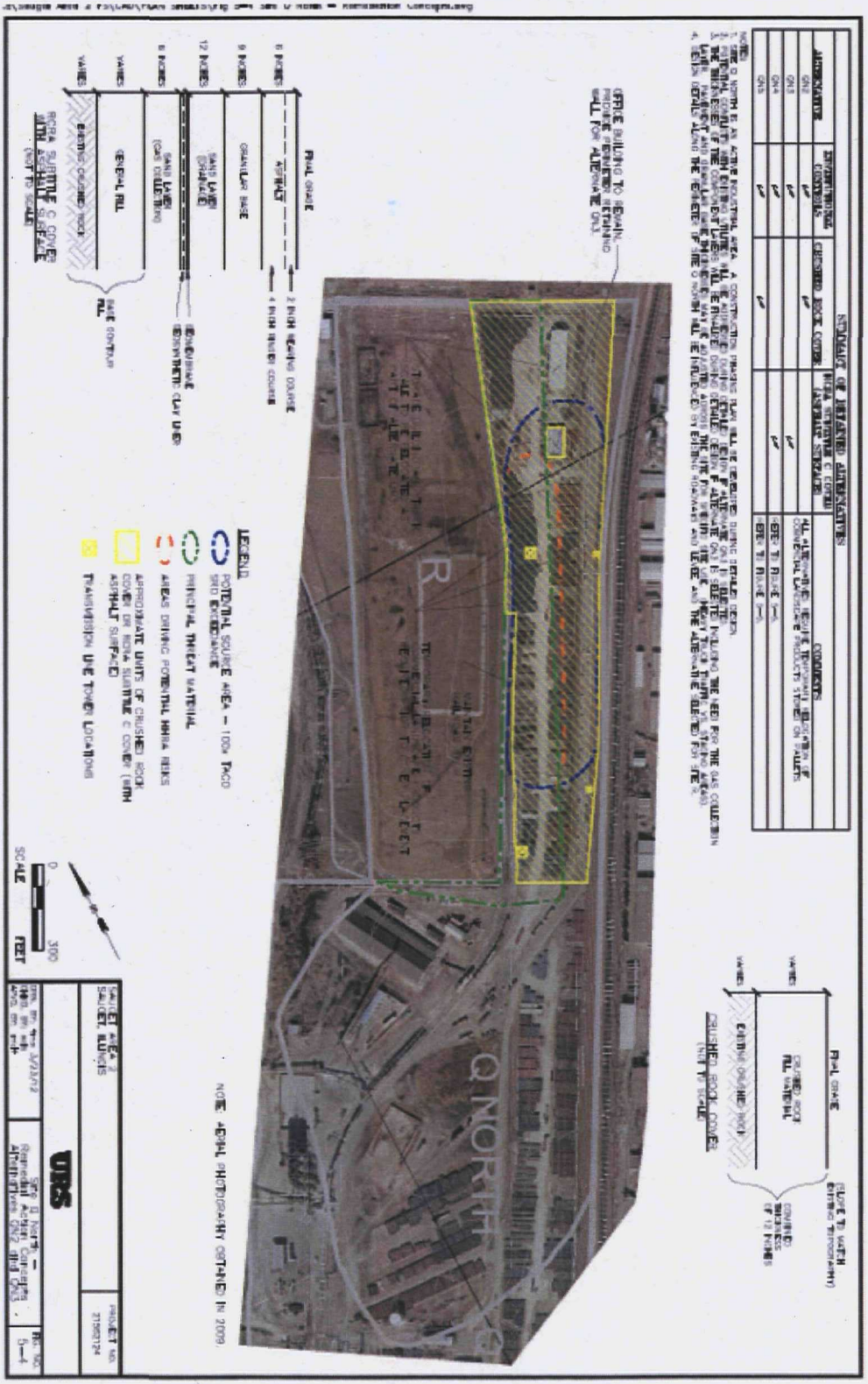


Figure 8: Site Q North: Alternatives QN4/QN5

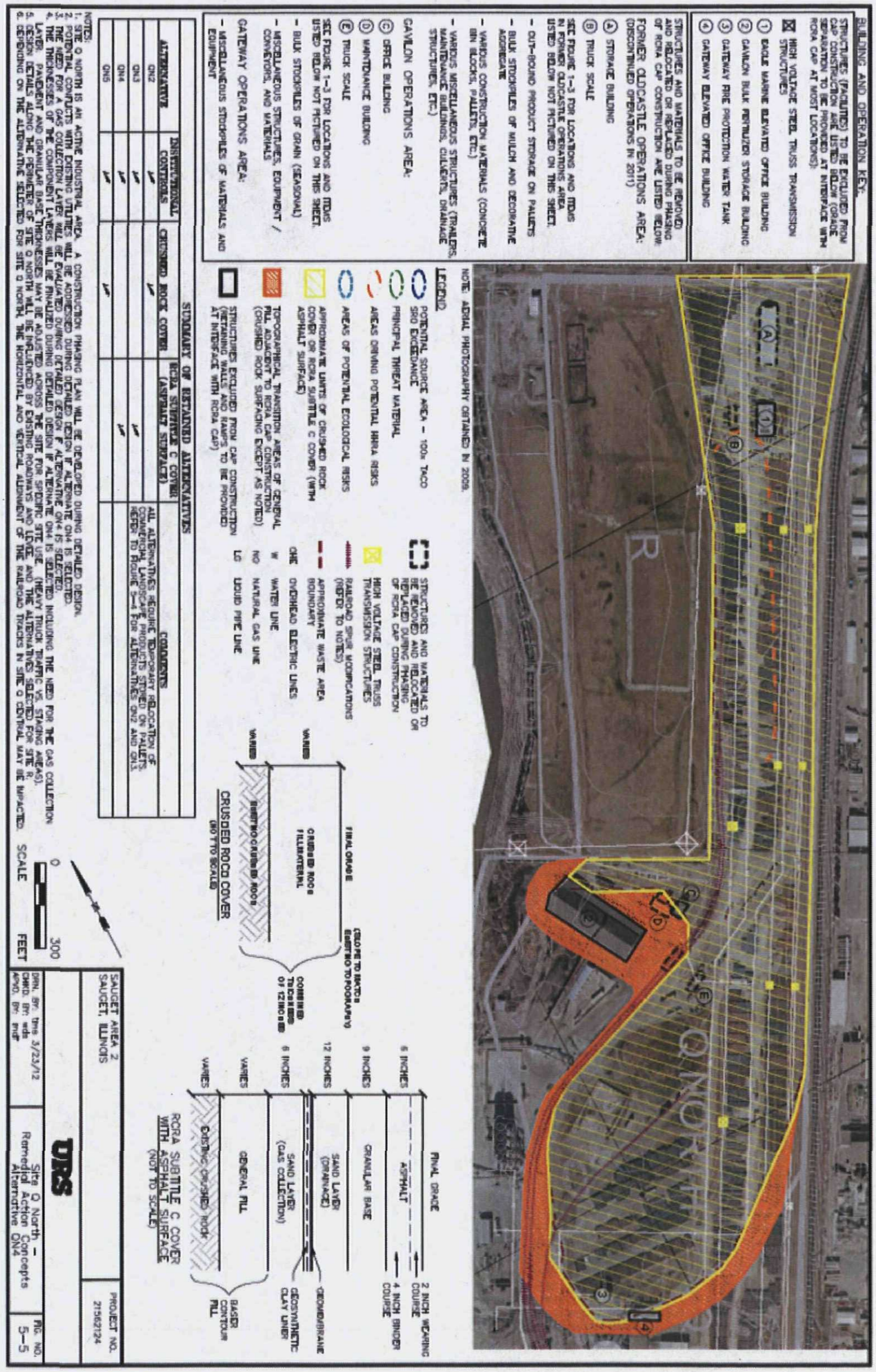


Figure 9: Site Q Central: Alternatives QC2/QC3

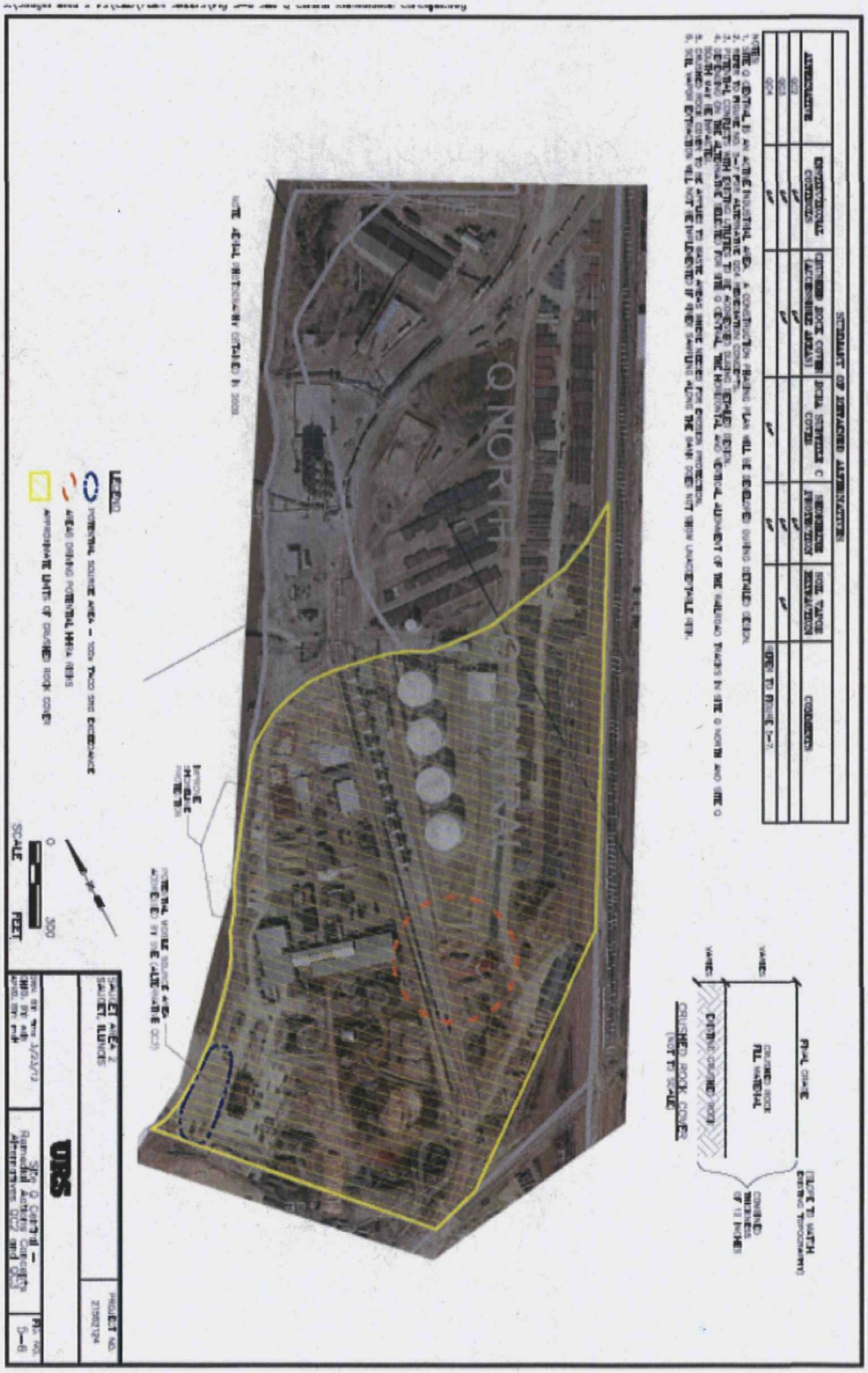
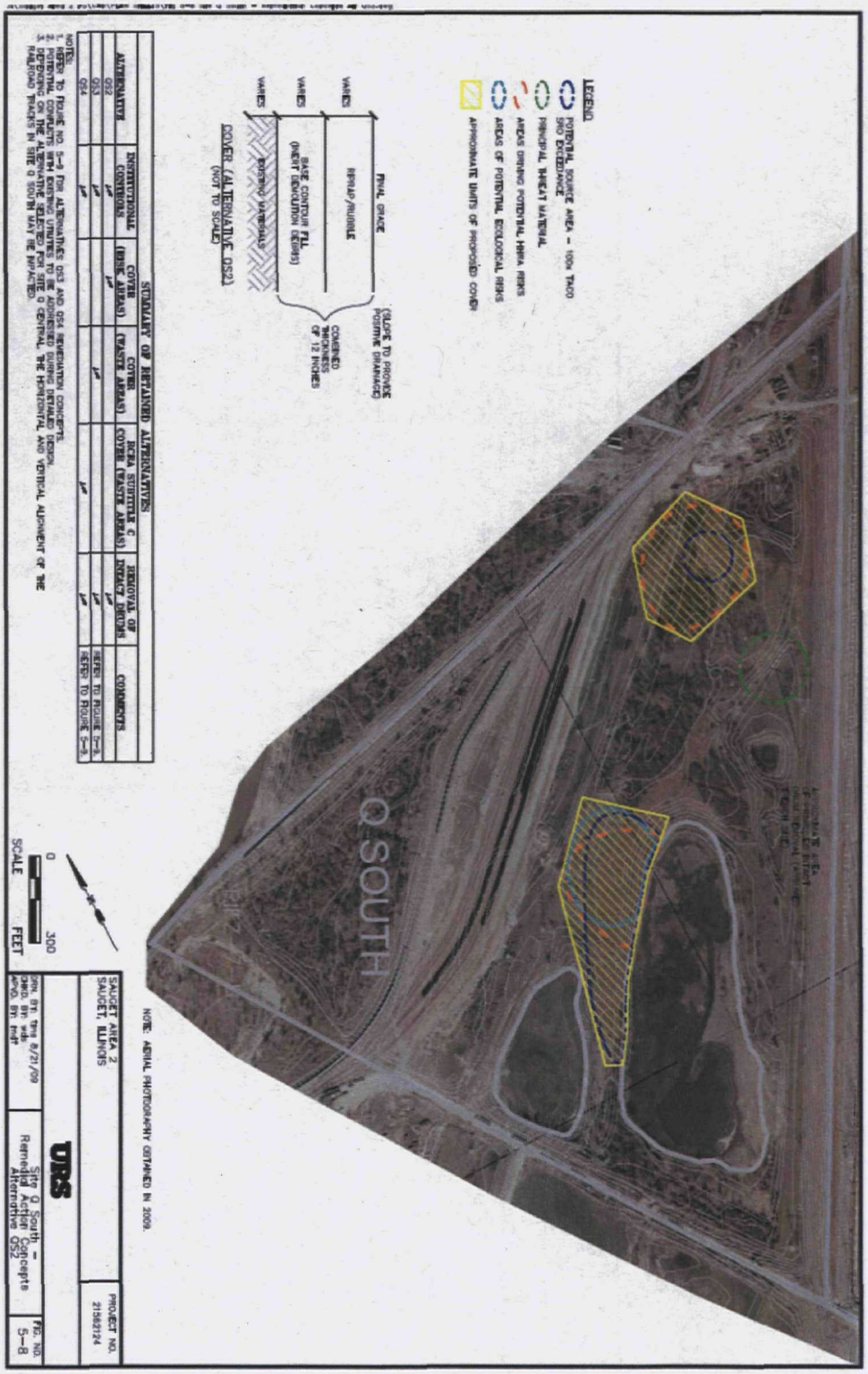


Figure 10: Site Q Central: Alternative QC4

Figure 11: Site Q South: Alternative QS2



SUMMARY OF REMAINED ALTERNATIVES

ALTERNATIVE	INSTITUTIONAL CONTROLS	COVER (RIPRAP)	COVER (WASTE AREAS)	AREA SUITABLE C COVER (WASTE AREAS)	REMOVAL OF INTACT STRUCTURES	COMMENTS
QS2	✓	✓	✓			
QS3	✓	✓	✓	✓	✓	REFER TO FIGURE 5-9
QS4	✓	✓	✓	✓	✓	REFER TO FIGURE 5-9

NOTES:
1. REFER TO FIGURE NO. 5-9 FOR ALTERNATIVES QS3 AND QS4 REMEDIATION CONCEPTS.
2. POTENTIAL CONFLICTS WITH EXISTING UTILITIES TO BE ADDRESSED DURING DETAILED DESIGN.
3. DEPENDING ON THE ALTERNATIVE SELECTED FOR SITE Q CENTRAL, THE HORIZONTAL AND VERTICAL ALIGNMENT OF THE RAILROAD TRACKS IN SITE Q SOUTH MAY BE IMPACTED.

Figure 12: Site Q South: Alternatives QS3/QS4

Figure 13: Site R: Alternatives R2/R3

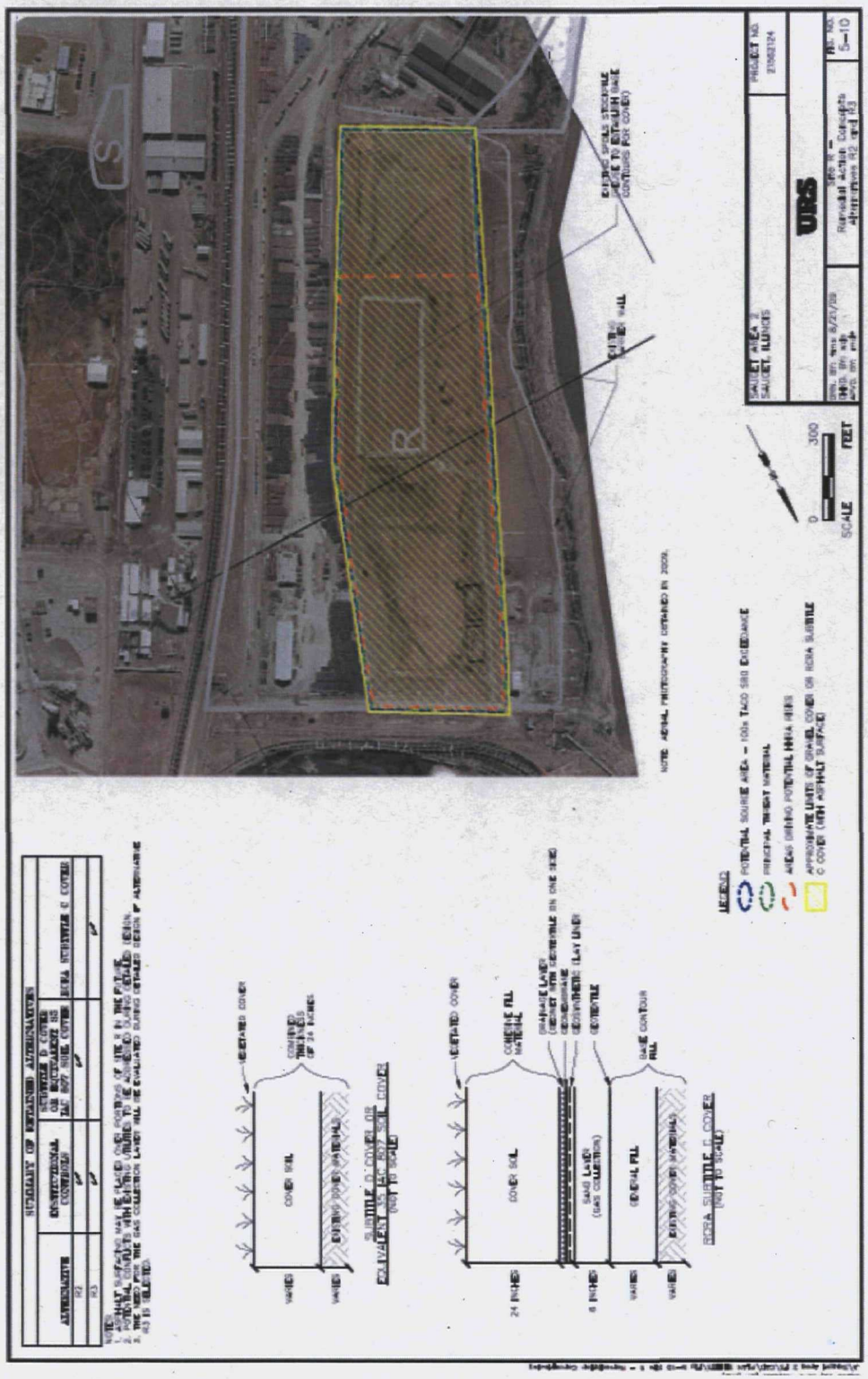
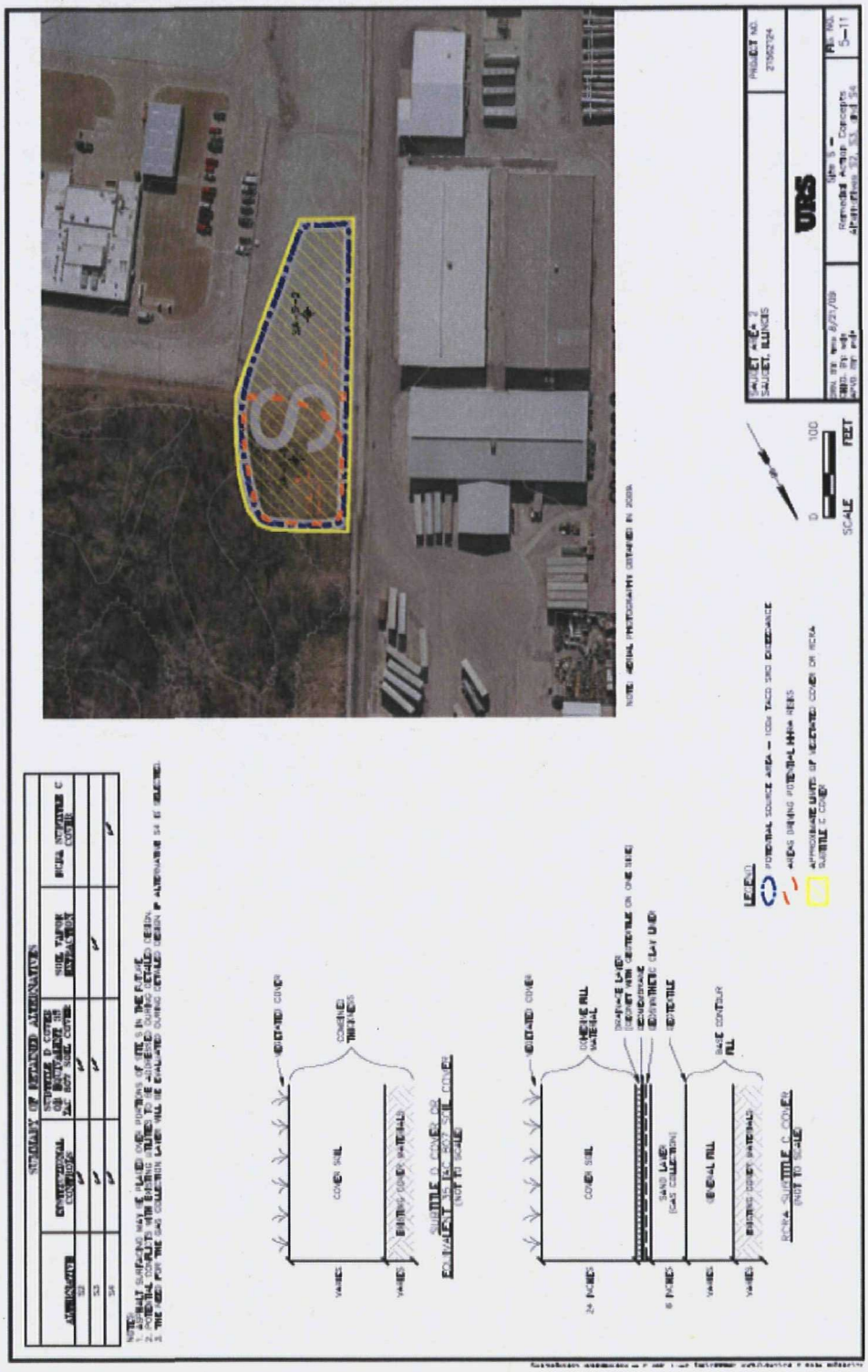


Figure 14: Site 2: Alternatives S2, S3, S4



APPENDIX A

ADMINISTRATIVE RECORD INDEX

U.S. Environmental Protection Agency
Remedial Action

Administrative Record
For
Sauget Area 2 Site Wide
Sauget and Cahokia, St. Clair County, Illinois

UPDATE 1
June 5, 2013
SEMS ID: 902713

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	141603	9/23/94	U.S. EPA	File	Administrative Record Site Index for Sauget Area 2 Site Q - Removal Action - Original (*The documents listed in this index are incorporated by reference into this Administrative Record*)	1
2	141574	11/19/98	U.S. EPA	File	Administrative Record Site Index for Sauget Area 2 Site Q - Second Removal Action - Original (*The documents listed in this index are incorporated by reference into this Administrative Record*)	1
3	350031	7/1/08	AMEC Earth and Environmental	Sauget Area 2 Sites Committee	Revised Baseline Ecological Assessment for Sauget Area 2 Sites	1497
4	317203	8/1/08	URS Corporation	Sauget Area 2 Site Group	Principal Threat Wastes Technical Memorandum	284
5	359815	9/4/08	URS Corporation	U.S. EPA	Vapor Intrusaion Data Validation Report for Sauget Area 2	107
6	419725	1/1/09	URS Corporation	Sauget Area 2 Site Group	Remedial Investigation Report for Sauget Area 2	15099
7	902712	10/1/09	AECOM	Sauget Area 2 Sites Group	Human Health Risk Assessment for Sauget Area 2	2240

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
8	364621	5/1/10	U.S. EPA	File	Community Involvement Plan for Sauget Area 1 and Area 2 Superfund Sites	22
9	902697	5/1/13	Uphoff, G., and S. Smith, Environmental Management Services	Linebaugh, S., U.S. EPA	Final Feasibility Study Report for the Sauget Area 2 Sites Group	1177
10	902711	6/1/13	U.S. EPA	Public	Fact Sheet: EPA Proposes Cleanup Plan for Soil and Ground Water	7
11	902710	6/2/13	U.S. EPA	Public	Proposed Plan for Sauget Area 2, Operable Unit 1	56

APPENDIX B

LIST OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Location Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Location-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas	40 CFR 6	Requires Federal agencies to evaluate the potential effects of actions to avoid adversely impacting floodplains, archeological sites, endangered species and wetland.	
	40 CFR 264.18	Establishes location standards for facilities where hazardous waste is disposed.	ARAR if a new landfill is located in the 100 year flood plain
	17 IAC 3706	Prohibits construction in floodways that will result in an increase of the water surface profile that exceeds .1 foot.	Potentially applicable to remedies at Sites Q and R, depending on the remedy chosen.
	33 CFR.323	Governs the discharge of fill material into wetlands.	Potentially applicable if wetlands are located in the area.
	17 IAC 3704	Regulates activities in and adjacent to state public waters.	Potentially applicable depending on remedy selections for Sites Q and R.
	40 CFR 6.302 40 CFR 6.Appendix A Executive Order 11988 (USEPA NEPA regulations; Federal Agencies Executive Order on Floodplains)	Activities that are taken within a floodplain shall avoid, to the extent possible, the long- and short-term adverse effects associated with occupancy and modification of floodplains. Measures shall be taken to mitigate adverse effects of actions in a floodplain, including measures to reduce the risk of flood loss; minimize the impact of floods on human safety and health, and restore/preserve the beneficial values of the floodplain. Structures constructed in a floodplain shall meet the standards and criteria set forth in the regulations promulgated by the Federal Insurance Administration pursuant to the National Flood Insurance Act of 1968.	Applicable to remedies at Sites Q and R, depending on the remedy chosen.
	35 IAC 724.118 b) (Illinois RCRA Hazardous Waste Permit Program regulations similar to 40 CFR 270.14(b)(11)(iv))	Any RCRA Subtitle C TSDF located within a 100-year floodplain must be designed, constructed, and maintained to prevent washout.	Relevant and Appropriate

Location Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Location Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 703.184 d) (Illinois RCRA Hazardous Waste regulations (Subpart B General Facility Standards – Location Standards similar to 40 CFR 264.18(b))	Engineering analysis required to indicate the various hydrodynamic and hydrostatic forces expected to result at the site as a consequence of a 100-year flood; Structural or other engineering studies showing the design of operational units and flood protection devices (e.g., floodwalls, dikes) at the facility and how these will prevent washout.	Relevant and Appropriate
	17 IAC Part 3700 (Illinois Department of Natural Resources (IDNR)-Construction in Floodways of Rivers, Lakes and Streams)	Applies to all rivers, lakes and streams under the department's jurisdiction. Construction in the floodway of any stream serving a tributary area of 6,400 acres or more is subject to this part. Construction activities in the floodway must be permitted (3700.40). However for construction other than levees, the worst-case analysis does not involve flood events in excess of the 100-year frequency flood. Floodplain construction that occurred before July 1, 1985 is considered grandfathered in. Many activities permitted under this part require review by the U.S. Army Corps of Engineers and the IEPA.	Applicable
	17 IAC 3704 Regulation of Public Water (IDNR regulations for construction in rivers)	Applies to construction activities to be undertaken within the river below normal water stage elevation.	Relevant and Appropriate to the remedy at Site Q Central

Action Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas	40 CFR 300	National Contingency Plan outlines procedures for remedial actions and for planning and implementing off-site removal actions.	Applicable
	40 CFR 258	Establishes minimum national criteria for management of non-hazardous wastes.	Applicable if waste is taken off site, potentially relevant and appropriate depending on site specific issues.
	40 CFR 261	Identifies solid wastes that are subject to regulation as hazardous wastes	Potentially applicable if hazardous waste is taken off site.
	40 CFR 262	Establishes requirements for generators of hazardous wastes	Potentially applicable if hazardous waste is taken off site.
	40 CFR 263	Establishes standards that apply to persons transporting manifested hazardous wastes within the US	Potentially applicable if hazardous waste is taken off site.
	40 CFR 264	Defines minimum standards for management of hazardous waste.	Potentially relevant and appropriate if a particular requirement has technical merit for the site involved.
	40 CFR 265	Defines requirements for construction maintenance closure and post-closure for hazardous waste landfills.	Potentially relevant and appropriate if a particular requirement has technical merit for the site involved.
	40 CFR 268	Identifies hazardous wastes that are restricted from land disposal	Potentially applicable if hazardous waste is taken off site.
	40 CFR 761	Requirements for management of PCB wastes and PCB-contaminated media.	Potentially applicable if waste is taken off site. Potentially relevant and appropriate if some types of waste are left on site.
	29 CFR 1910.120	Standards for conducting work at hazardous waste sites.	Applicable
Fill Areas (con't)	40 CFR 125	Establishes technology-based limits for direct discharge of treatment system effluent	Potentially applicable if the remedy includes direct discharges.
	40 CFR 402	Controls direct discharge of pollutants to surface waters through the National Pollutant Discharge Elimination System (NPDES) program	Potentially applicable if the remedy includes direct discharges.

Action Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
	40 CFR 403.5	Specifically prohibits the direct discharge of pollutants to a publicly-owned treatment works without treatment, that interfere with operations, or that contaminate sludge	Applicable if the remedy includes direct discharges.
	29 CFR 1910.120	Standards for conducting work at hazardous waste sites	Applicable
	29 CFR 1926	OSHA safety and health standards	Applicable
	35 IAC 307.1101	Sewer discharge criteria that prohibit entry of certain types of pollutants into a POTW	Applicable if the remedy includes direct discharges.
	35 IAC 212, Subpart K (Illinois Air Pollution regulations)	Measures need to be implemented to control fugitive dust emissions so that there will be no visible emissions at the property line and fugitive dust emissions do not exceed 20% opacity. Control measures typically include the application of water or other dust suppressants during clearing, grubbing, and grading.	Applicable
	35 IAC 309.202 (Illinois Construction Permits)	Required State construction permit for any new water treatment works, sewer or wastewater sources or any modification to existing treatment works, sewer or wastewater sources.	Not Applicable
	16 U.S.C. 1531 et seq., Sect. 7(a)(2) (U.S. Threatened and Endangered Species Act)	Actions that jeopardize the existence of a listed species, or result in the destruction or adverse modification of critical habitat, must be avoided or reasonable and prudent mitigation measures taken. The lead agency must determine whether T&E species or their critical habitat are present and conduct informal consultation with the U. S. Fish and Wildlife Service. Determination that T&E species or their critical habitat may be impacted by the proposed action requires preparation of a biological assessment to determine the extent of any possible impacts.	Applicable

Action Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	520 ILCS 10/3 (Illinois Endangered Species Protection Act)	Prohibits actions that result in takings of state-listed species, such as actions that jeopardize the continued existence of a listed species or result in destruction or adverse modification of its critical habitat.	Applicable
	35 IAC 724.211 a) and b) (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.111)	Closure Performance Standard: The owner or operator must close the facility in a manner that does the following: a) The closure minimizes the need for further maintenance; b) The closure controls, minimizes, or eliminates, to the extent necessary to adequately protect to human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous decomposition products to the ground or surface waters or to the atmosphere	Relevant and Appropriate
	35 IAC 724.212 a) and b) (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.112)	Closure Plan: Requires owners of hazardous waste facilities to submit a written closure plan (the approved plan becomes a condition to any RCRA permit). The closure plan describes the steps necessary for final closure. 724.212(a) (2), 724.212(b) (2) and 724.212(b) (4) are substantive requirements.	Relevant and Appropriate
	35 IAC 724.214 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.114)	Disposal or Decontamination of Equipment, Structures, and Soil: All contaminated equipment, structures, and soils must be properly disposed of or decontaminated.	Relevant and Appropriate

Action Specific ARARs
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Action Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 724.215 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.115)	Certification of Closure: Within 60 days after completion of closure, the owner or operator must submit to the Agency, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer.	Relevant and Appropriate
	35 IAC 724.216 35 IAC 724.409 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care and Subpart N Landfills Surveying and Recordkeeping) similar to 40 CFR 264.116; 40 CFR 264.309)	Survey Plat: No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner or operator must submit to any local zoning authority or authority with jurisdiction over local land use and to the Agency and record with land titles, a survey plat indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority or the authority with jurisdiction over local land use must contain a note, prominently displayed, that states the owner's and operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with Subpart G of this Part.	Relevant and Appropriate
	35 IAC 724.217 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.117)	Post-Closure Care and Use of Property a) Requires a Post-Closure Care Period of at least 30 years after completion of closure for the unit b) must require continuation at partial or final closure of any of the security requirements of Section 724.114 during part or all of the post-closure period when either of the following is true: - hazardous wastes may remain exposed after completion of partial or final closure; or - access by the public or domestic livestock may pose a hazard to human health. d) All the post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in Section 724.218.	Relevant and Appropriate

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Action Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 724.217 c) (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.117)	Post-Closure Care and Use of Property c) Post-closure use of property on or in which hazardous wastes remain after closure must never be allowed to disturb the integrity of the final cover unless the Agency determines it is necessary for reasons listed in the regulations	Relevant and Appropriate
	35 IAC 724.218 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.118)	Post-Closure Plan The owner must have a written postclosure plan which must identify the activities that will be carried on after closure and the frequency of these activities (including planned monitoring activities and frequencies, planned maintenance activities, and name, address, and phone number of the person or office to contact). The relevant and appropriate requirements in 724.218 are: 724.218(b)(1) and (b)(2) – the post-closure plans must incorporate monitoring and maintenance activities that comply with the substantive requirements of 724 Subparts F and N.	Relevant and Appropriate
	35 IAC 724.219 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.119)	Post-Closure Notices: Requires within 60 days after certification of closure the owner or operator of a disposal facility to submit to the Agency, to the County Recorder and to any local zoning authority or authority, a record of the type, location, and quantity of hazardous wastes disposed (for hazardous wastes disposed of before January 12, 1981, the owner or operator must identify these items to the best of the owner or operator's knowledge and in accordance with any records). In addition, the owner or operator is required to record a notation on the deed to the facility property (or on some other instrument that is normally examined during title search) that will in perpetuity notify any potential purchaser of the property that the land has been used to manage hazardous wastes; its use is restricted; and the survey plat and record of the type, location, and quantity of hazardous wastes disposed been filed with the Agency, the County Recorder and any local zoning authority or authority with jurisdiction over local land use.	Relevant and Appropriate

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Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 724.220 (Illinois RCRA Hazardous Waste regulations (Subpart G Closure and Postclosure Care) similar to 40 CFR 264.120)	Certification of Completion of Post-closure Care: Within 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner or operator must submit to the Agency, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan.	Relevant and Appropriate
	35 IAC 724.242 – 724.251 (Illinois Hazardous Waste Regulations (Subpart H - Financial Requirements for Closure and Post-Closure Care))	These sections require an owner/operator of a regulated unit to provide cost estimates and financial assurance for both closure and post-closure care.	Not Applicable
	35 IAC 724.410 a)1 – 4 (Illinois RCRA Hazardous Waste regulations (Subpart N Landfills Closure and Postclosure Care) similar to 40 CFR 264.310(a))	At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to do the following: 1) Provide long-term minimization of migration of liquids through the closed landfill; 2) Function with minimum maintenance; 3) Promote drainage and minimize erosion or abrasion of the cover; 4) Accommodate settling and subsidence so that the cover's integrity is maintained	Item 1 Relevant But Not Appropriate to Site Conditions Items 2-4 Relevant and Appropriate

Action Specific ARARs			
Medium	ARAR	Description	Rationale
Fill Areas (con't)	35 IAC 724.410 b) 1,4,5,and 6 (Illinois RCRA Hazardous Waste regulations (Subpart N Landfills Closure and Postclosure Care) similar to 40 CFR 264.310(b))	After final closure, the owner or operator must comply with all post-closure requirements contained in Sections 724.217 through 724.220, including maintenance and monitoring throughout the post-closure care period (specified in the permit under Section 724.217). After final closure the owner or operator must do the following: 1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events; 4) Maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of Subpart F of this Part; 5) Prevent run-on and run-off from eroding or otherwise damaging the final cover; and 6) Protect and maintain surveyed benchmarks	Relevant and Appropriate
	35 IAC 722.111 (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 262.11)	Characterization of generated waste to determine if it is a hazardous waste. Any person who generates a solid waste must determine if that waste is hazardous by evaluation of whether the waste is excluded from hazardous waste regulation; listed under 35 IAC 721, Subpart D; or exhibits one of the hazardous waste characteristics under 35 IAC 721, Subpart C.	Applicable
	40 CFR 761.61 (USEPA TSCA regulations)	Characterization of soils, liquids and decontamination fluids to determine whether they are PCB-remediation waste (as found concentrations of PCBs are 50 ppm or greater).	Applicable
	35 IAC 722.134 (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 262.34)	Allows for storage of hazardous waste in containers for 90 days or less while alleviating the need to meet all the requirements for a container storage area.	Applicable

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Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 724.275 (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 264.175)	Design standards for hazardous waste container storage area.	Relevant and Appropriate to remedies at Sites Q Central and S, depending on the remedy chosen.
	35 IAC 724.271 – 279 (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 264.171 – 179)	Requirements for condition, handling, containment, compatibility, and marking containers used to store or treat hazardous waste or environmental media containing a hazardous waste.	Relevant and Appropriate
	35 IAC 724.297 (Illinois Hazardous Waste regulations for tank systems)	Applies to owners and operators of facilities that use tank systems for storing or treating hazardous waste.	Not Applicable or Relevant to Site Conditions
	35 IAC 724.328 (Illinois Hazardous Waste regulations for surface impoundments)	Applies to owners and operators that use surface impoundments to treat, store, or dispose of hazardous waste.	Not Applicable or Relevant to Site Conditions
	35 IAC 724.653 a) b) d) and e) (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 264.553)	Requirements associated with establishing temporary storage of hazardous waste (hazardous soils, water, and decontamination fluids) in tanks or containers during remediation.	Relevant and Appropriate
	35 IAC 724.101 g) (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 264.1(g))	Exemption from RCRA tank standards for tanks that are part of a wastewater treatment unit (tanks used to temporarily store hazardous wastewaters sent to a wastewater treatment facility for treatment on- or off-site).	Applicable
	40 CFR 761.65 (USEPA TSCA regulations)	Storage area design and operation requirements for storage of TSCA-regulated PCB-containing wastes for disposal in containers.	Relevant and Appropriate
	35 IAC 101-104 (Illinois Construction and Demolition Landfill Citing Restrictions)	Requirements for landfilling C&D.	Not Applicable or Relevant to Site Conditions

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Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 1100 (Illinois Clean Construction or Demolition Debris Fill Operations)	Applies to all clean construction or demolition debris (CCDD) fill operations that are required to be permitted in a current or former quarry, mine or other excavation.	Relevant and Appropriate (Site Q South only)
	35 IAC 306.302 (Illinois Performance Criteria – Expansion of Combined Sewer Service)	The expansion of existing or establishment of new combined sewer service area is prohibited, except when approved by Agency in accordance with the provisions in this section.	Not Applicable or Relevant to Site Conditions
	35 IAC 807 Subpart C (Illinois Sanitary Landfills)	Final cover (807.305(a)); Prohibitions against open burning (807.311), air pollution (807.312), water pollution (807.313) and waters of the state (807.315); and, requirements for implementation of closure requirements (807.318).	Applicable (Site P)
	35 IAC 807 Subpart E (Illinois Closure and Post-Closure Care)	All sections	Applicable (Site P)
	35 IAC 807 Subpart F (Financial Assurance for Closure and Post-closure care)	All sections	Not Applicable. Relevant But Not Appropriate to Site Conditions
	35 IAC 811.107 (New Solid Waste Landfills -Operating Standards)	New landfills must not accept solid waste from vehicles that do not utilize devices such as cover or tarpaulins to control litter. Trucks exiting or entering the site(s) with solid waste must be tarped.	Not Applicable. Relevant But Not Appropriate to Site Conditions
	35 IAC 811.111 (New Solid Waste Landfills Post-closure Maintenance)	This section describes post-closure maintenance activities including the specification of inspection frequencies; filling of rills, gullies or crevices; repair of eroded and scoured drainage channels; filling of holes and depressions; revegetation of reworked surfaces or eroded vegetation of 100 sq ft; and, identification of planned uses of the property.	Not Applicable. Relevant But Not Appropriate to Site Conditions
	35 IAC 811.314 (New Solid Waste Landfill - Final Cover System)	This section provides standards for low permeability and final protective layers of a new solid waste landfill.	Not Applicable. Relevant But Not Appropriate to Site Conditions

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Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 811.319 (New Solid Waste Landfill - Groundwater Monitoring Program)	Requires groundwater monitoring to continue for 15 years after closure, or in the case of MSWLF units, a minimum of 30 years after closure. Quarterly monitoring is required for 5 years and semi-annual after that.	Not Applicable. Relevant But Not Appropriate to Site Conditions
	765 ILCS 122/1 et seq. Illinois' Uniform Environmental Covenants Act.	An owner or owners of real property may voluntarily enter into an environmental covenant, as a grantor of an interest in the real property, with an agency and, if appropriate, one or more holders. No owner, agency, or other person shall be required to enter into an environmental covenant as part of an environmental response project; provided, however, that (i) failure to enter into an environmental covenant may result in disapproval of the environmental response project; and (ii) once the owner, agency, or other person assumes obligations in an environmental covenant they must comply with those obligations of the environmental covenant in accordance with this Act.	To Be Considered
	35 IAC 301.108 (Illinois Water Quality and Pollution Control regulations general provisions)	The Illinois Pollution Control Board may grant an adjusted standard to an applicable regulatory standard for persons who can justify such an adjustment consistent with subsection (a) of section 27 of the Illinois Environmental Protection Act.	Applicable

Action Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Action Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Groundwater	35 IAC 724.197 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.97)	724.197(a) - The groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that fulfill the following requirements: 1) They represent the quality of background water, 2) They represent the quality of groundwater passing the point of compliance; and, 3) They allow for the detection of hazardous waste or hazardous constituents that have migrated to the uppermost aquifer. 724.197(c) - All monitoring wells must be cased in accordance with this section. 724.197(d) - The groundwater monitoring program must include consistent sampling and analysis to ensure a reliable indication of groundwater quality below the waste management area. The program must include procedures and techniques for the following: 1) Sample collection; 2) Sample preservation and shipment; 3) Analytical procedures; and 4) Chain of custody control. 724.197(e) - The groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples. 724.197(f) - The groundwater monitoring program must include a determination of the groundwater surface elevation each time groundwater is sampled. 724.197 (h) and (i) - Specifies the statistical methods that may be used in evaluating groundwater monitoring data and performance standards for each statistical method	Relevant and Appropriate

Action Specific ARARs
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Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Groundwater (con't)	35 IAC 724.196 a) (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.96 (a))	Compliance Period: The Agency must specify in the facility permit the compliance period during which the groundwater protection standard of Section 724.192 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	Relevant and Appropriate
	35 IAC 724.199 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.99)	Compliance Monitoring Program: An owner or operator is required to establish a compliance monitoring program to meet the requirements of this section.	Relevant and Appropriate
	35 IAC 724.200 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.100)	Corrective Action: An owner or operator is required to establish a corrective action program in accordance with this section.	Relevant and Appropriate
	35 IAC 309.102 (Illinois NPDES Storm Water regulations Analogous to 40 CFR 122.26)	Storm water discharge requirements are applicable to activities at the SA2 Sites involving disturbance of cover in an area of 1 acre or more total. The types of controls typical to SWPPP include, but are not limited to: storm water run-off conveyances, diversion dikes, sediment fences, sediment traps, limitations on the size of disturbed areas, and sequencing of construction to minimize and control disturbances.	Applicable

Action Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Action-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Surface Water	10 CFR 230.10(a), (b), (c) and (d) 40 CFR 230 Subpart H (USEPA Clean Water Act regulations)	The discharge of dredged or fill material into Waters of the United States, including jurisdictional (adjacent) wetlands, is prohibited if there is a practical alternative that would have less adverse impact. No discharge shall be permitted that results in violation of state water quality standards, violates any toxic effluent standard, and/or jeopardizes an endangered species or its critical habitat. No discharge will be permitted that will cause significant degradation of Waters of the United States. No discharge is permitted unless mitigation measures have been taken in accordance with 40 CFR 230, Subpart H. Compensatory mitigation for loss of wetlands shall be provided for wetlands > 0.25 acre. Compensatory mitigation shall be at a ratio of 2:1 for restoration, 4:1 for creation and enhancement, and 10:1 for preservation.	Applicable
	40 CFR 230.10 (a)-(d) 40 CFR 230 33 CFR 320 (USEPA Clean Water Act regulations)-	The discharge of dredged or fill material into Waters of the United States is prohibited if there is a practical alternative that would have less adverse impact. No discharge shall be permitted that results in violation of state water quality standards, violates any toxic effluent standard, or jeopardizes an endangered species. No discharge is permitted that will cause significant degradation of Waters of the United States. Mitigative measures must be implemented in accordance with 40 CFR 230, Subpart H.	Applicable
	16.U.S.C. 661 et seq., (Sections 661-663 and 668) (U.S. Fish and Wildlife Coordination Act)	Activities that modify water bodies must consult and coordinate with the U.S. Department of the Interior to ensure that the activity conserves wildlife resources and prevents the loss and damage to such resources.	Relevant and Appropriate
Surface Water (con't)	35 IAC 309.102 (Illinois NPDES Storm Water regulations Analogous to 40 CFR 122.26)	Storm water discharge requirements are applicable to activities at the SA2 Sites involving disturbance of cover in an area of 1 acre or more total. The types of controls typical to SWPPP include, but are not limited to: storm water run-off conveyances, diversion dikes, sediment fences, sediment traps, limitations on the size of disturbed areas, and sequencing of construction to minimize and control disturbances.	Applicable

Action Specific ARARs
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Chemical Specific ARARs
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Chemical-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas	40 CFR 63	Contains national emission standards for hazardous air pollutants (NESHAP)	Relevant and appropriate to remedial actions that include emissions to the atmosphere.
	40 CFR 261, 263 and 268	Classification, transport, and disposal of hazardous waste.	Applicable if hazardous waste is sent off site. Potentially relevant and appropriate for actions on site.
	40 CFR 761	Defines requirements for management of PCB waste and PCB-contaminated materials under TSCA, including requirements for a chemical waste landfill.	Potentially relevant and appropriate if waste is left in place, applicable if PCB waste is sent off site.
	35 IAC 742	Provides for a tiered approach to developing remediation objectives, and describes how certain actions meet remediation objectives.	To be Considered
	40 CFR 141	MCLs for specifically identified constituents in drinking water	Potential relevant and appropriate although local ordinances prevent use of groundwater for potable purposes.
	40 CFR 264.92	Establishes groundwater protection standards for hazardous waste treatment and disposal facilities	Potential ARAR depending on activity at any one site.
	35 IAC 724.192 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.92)	Groundwater Protection Standard: The owner or operator must ensure that hazardous constituents under Section 724.193 detected in the groundwater from a regulated unit do not exceed the concentration limits under Section 724.194 in the uppermost aquifer underlying the waste management area beyond the point of compliance under Section 724.195 during the compliance period under Section 724.196.	Relevant and Appropriate

Chemical Specific ARARs
Sauget Area 2 Sites
Sauget, IL

Chemical-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 724.193 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.93)	Hazardous Constituents: The Agency must specify in the facility permit the hazardous constituents to which the groundwater protection standard of Section 724.192 applies. Hazardous constituents are constituents identified in Appendix H of 35 Ill. Adm. Code 721 that have been detected in groundwater in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Agency has excluded them under subsection (b) of this Section.	Relevant and Appropriate
	35 IAC 724.194 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.94)	Concentration Limits: The Agency must specify in the facility permit concentration limits in the groundwater for hazardous constituents established under Section 724.193. The following must be true of the concentration of a hazardous constituent: 1) It must not exceed the background level of that constituent in the groundwater at the time that limit is specified in the permit; or, 2) For any of the constituents listed in Table 1, it must not exceed the respective value given in that Table if the background level of the constituent is below the value given in Table 1; or, 3) It must not exceed an alternative limit established by the Agency under subsection (b) of this Section.	Relevant and Appropriate
	35 IAC 724.195 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.95)	Point of Compliance: The Agency must specify in the facility permit the point of compliance at which the groundwater protection standard of Section 724.192 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	Relevant and Appropriate
	35 IAC 728.109 a) (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 268.7)	Requires a generator to determine whether generated hazardous waste is prohibited from land disposal, including waste codes, treatment standards and underlying hazardous constituents.	Applicable

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Sauget, IL

Chemical Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Fill Areas (con't)	35 IAC 728.140 a) (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 268.40(a))	Disposal requirement that all hazardous waste or hazardous waste containing media must meet applicable LDR treatment standards prior to disposal.	Applicable
	35 IAC 722.130 – 134 (Illinois RCRA Hazardous Waste regulations similar to 40 CFR 262)	Pre-transport requirements requires the generator to package the waste, label each package, mark each package, and placard or offer the initial transporter the appropriate placards in accordance with the U. S. Department of Transportation regulations prior to transporting hazardous waste or offering hazardous waste for transportation off-site.	Applicable
	35 IAC 722 and 723 92 IAC 171-178 (Illinois RCRA Hazardous Waste regulations and the Illinois Department of Transportation hazardous material regulations)	For any hazardous waste, all RCRA hazardous waste generator and transporter requirements including administrative requirements (manifests, EPA ID number, etc...) as well as the Illinois Department of Transportation requirement for hazardous materials (which incorporate the US Department of Transportation hazardous material regulations) would apply.	Applicable
	35 IAC 742 (Illinois Tiered Approach to Corrective Action Objectives)	Sets forth procedures for evaluating the risk to human health posed by environmental conditions and developing remediation objectives that achieve acceptable risk levels based upon site-specific conditions.	To Be Considered
	35 IAC 307.1101 (Illinois sewer discharge criteria)	Prohibition against discharge of certain types of pollutants into a Publicly Owned Treatment Works.	Relevant and Appropriate
	35 IAC 809 (Illinois Special Waste Hauling regulations)	For wastes which meet the definition of a Special Waste (35 IAC 808) in Illinois, the special waste regulations, including administrative requirements, relating to manifesting and transport would apply.	Applicable
Groundwater	40 CFR 264.94	Establishes maximum concentration limits. Provides for establishment of alternate limits for groundwater protection	Potential ARAR depending on activity at any one site.
	40 CFR 264.95	Establishes point of compliance for which groundwater quality standards apply	Potential ARAR depending on activity at any one site.

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Chemical-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Groundwater (con't)	40 CFR 131	Establishes criteria for water quality for surface water.	May be ARAR if an alternative includes a point discharge, otherwise TBC.
	35 IAC 620.405 (Illinois Groundwater Quality Standards)	Prohibits any person from causing, threatening, or allowing release of contaminants to groundwater resulting in exceedence of groundwater quality standards.	Applicable
	35 IAC 620.410 (Illinois Groundwater Quality Standards)	Class 1 groundwater standards (in general equivalent to a drinking water standard or the MCL).	Applicable
	35 IAC 620.250 (Illinois Groundwater Quality Standards)	A groundwater management zone (GMZ) may be established for a three dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site: (1) That is subject to a corrective action process approved by the Agency; or (2) For which the owner or operator undertakes an adequate corrective action in a timely and appropriate manner. The GMZ suspends the groundwater quality standards during the period of remediation until the groundwater quality standards have been attained.	Applicable
	35 IAC 620.260 (Illinois Groundwater Quality Standards)	Any person may petition the Illinois Pollution Control Board to reclassify a groundwater in accordance with the procedures for adjusted standards specified in Section 28.1 of the Act and 35 Ill. Adm. Code 106, Subpart G. In any proceeding to reclassify specific groundwater by adjusted standard, in addition to the requirements of 35 Ill. Adm. Code 106, Subpart G, and Section 28.1(c) of the Act, the petition shall, at a minimum, contain information specified in this section.	Applicable

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Sauget, IL

Chemical-Specific ARARs			
Medium	**ARAR**	**Description**	**Rationale**
Groundwater (con't)	35 IAC 724.191 (Illinois RCRA Hazardous Waste regulations (Subpart F General Groundwater Monitoring Requirements similar to 40 CFR 264.91)	Required Programs: Owners and operators subject to Subpart F must conduct a monitoring and response program as follows: 1) Whenever hazardous constituents pursuant to Section 724.193 from a regulated unit are detected at a compliance point pursuant to Section 724.195, the owner or operator must institute a compliance monitoring program pursuant to Section 724.199. 2) Whenever the groundwater protection standard pursuant to Section 724.192 is exceeded, the owner or operator must institute a corrective action program pursuant to Section 724.200. 3) Whenever hazardous constituents pursuant to Section 724.193 from a regulated unit exceed concentration limits pursuant to Section 724.194 in groundwater between the compliance point pursuant to Section 724.195 and the downgradient facility property boundary, the owner or operator must institute a corrective action program pursuant to Section 724.200	Relevant and Appropriate
Surface water	35 IAC 302.210 (Illinois Surface Water Quality Standards)	Waters of the State shall be free from any substances or combination of substances in concentrations toxic or harmful to human health, or to animal, plant or aquatic life. This regulation includes those constituents without a promulgated standard in 35 IAC 302.208. These derived water quality criteria may be found on IEPA's web site (http://www.epa.state.il.us/water /water-quality-standards/water-quality-criteria.html) and will include any additional criteria that IEPA develops to address specific chemicals associated with the SA2 Sites for which derived criteria have not been calculated already.	Applicable
Surface water (con't)	35 IAC 302.208 (Illinois Surface Water Quality Standards)	Numeric Surface Water Quality Standards are established for the protection of human health and aquatic life. The Mississippi River is not provided any specific surface water designation; therefore, the general use water quality standards would be applied. The general use water quality standards provide criteria for the protection of aquatic life (acute and chronic) and human health.	Applicable

Chemical Specific ARARs
Sauget Area 2 Sites
Sauget, IL

APPENDIX C

FEASIBILITY STUDY COST ESTIMATE FOR ALTERNATIVES O2, P3, QN2, QC3, QS3, R2, S3

Table 5-1
Site O and O North - Cost Estimate Summary Alternative O2:
35 IAC 724 Compliant Soil Cover
Over Identified Waste Areas, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$352,822**	Cap costs w/o contgncy
Constr Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post-Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Site Preparation					
Construction Staking	5	days	$1,675	$8,375	Survey crew
Tree Clearing (No Grubbing)	18	acre	$3,000	$54,000	Minimize soil disturbance
Haul/Dispose of Cleared Trees	72	loads	$90	$6,480	Load, haul, dispose
Brush mowing	31	acre	$530	$16,430	Medium density
Erosion Controls (silt fencing)	8,100	ln ft	$1.26	$10,206	Perimeter of work areas
SUBTOTAL				**$95,491**	
Soil Cover (top to bottom)					
Cover Soil (amended)	24,600	CY	$23.85	$586,710	Import, spread
Cover Soil	73,800	CY	$14.75	$1,088,550	Import, spread, compact
Fill for Base Contours	105,000	CY	$14.75	$1,548,750	Combine with existing cover
Scarify Existing Grnd Surface	31	acre	$592	$18,352	Prep surface for new fill
QC Testing	1	LS	$35,000	$33,000	Earthwork testing
SUBTOTAL				**$3,275,362**	
Site Restoration					
Surface Water Controls	8,100	ln ft	$2.50	$20,250	Drainage modifications
Fine Grading	31	acre	$823	$25,513	Prepare for seeding
Seeding/Fertilizer/Mulch	31	acre	$3,600	$111,600	Native grasses/low maint
SUBTOTAL				**$157,363**	
SUBTOTAL				**$3,881,038**	
Contingency	25%			$970,259	
SUBTOTAL				**$4,851,297**	
Project Management	5%			$242,565	Percentages based on
Pre-Design Inv/Remedial Design	10%			$485,130	EPA Guidance
Construction Management	6%			$291,078	
Institutional Controls					
Deed Restrictions	1	LS	$7,500	$7,500	
Access Restrictions	1	LS	$7,500	$7,500	
Soil Management Plan	1	LS	$7,500	$7,500	
TOTAL CAPITAL COST				**$5,892,569**	

Table 5-1 (cont)
Site O and O North - Cost Estimate Summary Alternative O2:
35 IAC 724 Compliant Soil Cover
Over Identified Waste Areas, and Institutional Controls

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Soil Cover Maintenance					
Repair Eroded Areas	3	days	$2,500	$7,500	Equipment & materials
Repair Vegetative Cover	1.5	acre	$3,600	$5,400	5% spot seeding/year
Maintain Surface Water Controls	3	days	$1,500	$4,500	
SUBTOTAL				**$17,400**	
Contingency	30%			$5,220	
SUBTOTAL				**$22,620**	
Project Management	10%			$2,262	
Site Inspections/Reporting	1	LS	$3,000	$3,000	Two inspections per year
Technical Support	15%			$3,393	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$32,275**	

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Five-Year Review Report					
Year 5	1	LS	$5,000	$5,000	
Year 10	1	LS	$5,000	$5,000	
Year 15	1	LS	$5,000	$5,000	
Year 20	1	LS	$5,000	$5,000	
Year 25	1	LS	$5,000	$5,000	
Year 30	1	LS	$5,000	$5,000	
Update Institutional Controls					
Year 5	1	LS	$2,500	$2,500	
Year 10	1	LS	$2,500	$2,500	
Year 15	1	LS	$2,500	$2,500	
Year 20	1	LS	$2,500	$2,500	
Year 25	1	LS	$2,500	$2,500	
Year 30	1	LS	$2,500	$2,500	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

Table 5-1 (cont)
Site O and O North - Cost Estimate Summary Alternative O2:
35 IAC 724 Compliant Soil Cover
Over Identified Waste Areas, and Institutional Controls

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$5,892,569			$5,892,569	1.0000	$5,892,569
1		$32,275		$32,275	0.9346	$30,164
2		$32,275		$32,275	0.8734	$28,190
3		$32,275		$32,275	0.8163	$26,346
4		$32,275		$32,275	0.7629	$24,622
5		$32,275	$7,500	$39,775	0.7130	$28,359
6		$32,275		$32,275	0.6663	$21,506
7		$32,275		$32,275	0.6227	$20,099
8		$32,275		$32,275	0.5820	$18,784
9		$32,275		$32,275	0.5439	$17,555
10		$32,275	$7,500	$39,775	0.5083	$20,220
11		$32,275		$32,275	0.4751	$15,334
12		$32,275		$32,275	0.4440	$14,330
13		$32,275		$32,275	0.4150	$13,393
14		$32,275		$32,275	0.3878	$12,517
15		$32,275	$7,500	$39,775	0.3624	$14,416
16		$32,275		$32,275	0.3387	$10,933
17		$32,275		$32,275	0.3166	$10,217
18		$32,275		$32,275	0.2959	$9,549
19		$32,275		$32,275	0.2765	$8,924
20		$32,275	$7,500	$39,775	0.2584	$10,279
21		$32,275		$32,275	0.2415	$7,795
22		$32,275		$32,275	0.2257	$7,285
23		$32,275		$32,275	0.2109	$6,808
24		$32,275		$32,275	0.1971	$6,363
25		$32,275	$7,500	$39,775	0.1842	$7,329
26		$32,275		$32,275	0.1722	$5,558
27		$32,275		$32,275	0.1609	$5,194
28		$32,275		$32,275	0.1504	$4,854
29		$32,275		$32,275	0.1406	$4,537
30		$32,275	$17,500	$49,775	0.1314	$6,539
Totals	$5,892,569	$968,250	$55,000	$6,915,819		**$6,310,568**
Rounded Totals (Millions)	$5.9 M	$1.0 M	$0.055 M	$6.9 M		**$6.3 M**

Table 5-5
Site P - Cost Estimate Summary Alternative P3:
Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5)
35 IAC 807 Solid Waste Landfill Cover Over Remainder of Identified Waste Areas, NAPL Collection Well (LEACH P-1), Vapor Intrusion Mitigation, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$117,232**	Cap costs w/o contingency
Constr Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Soil Cover - Waste Areas					
Site Preparation					
Construction Staking	3	day	$1,675	$5,025	Survey crew
Tree Clearing (No Grubbing)	1	acre	$3,000	$3,000	Minimize soil disturbance
Haul/Dispose of Cleared Trees	4	loads	$90	$360	Load, haul, dispose
Brush Mowing	10	acre	$530	$5,300	Medium density
Erosion Repair - East Slope	1,610	CY	$18.45	$29,705	Fill/regrade gulleys
Erosion Repair - West Slope	4,840	CY	$18.45	$89,298	Fill/regrade gulleys
Temporary Drainage Controls	7,740	ln ft	$1.26	$9,752	Perimeter silt fencing
SUBTOTAL				**$142,440**	
Soil Cover (waste areas)					
Cover Soil (amended)	8,100	CY	$23.85	$193,185	Import, spread
Cover Soil	24,300	CY	$14.75	$358,425	Import, spread, compact
Fill for Base Contours	19,500	CY	$14.75	$287,625	Combine with existing cover
Scarify Existing Grnd Surface	10	acre	$592	$5,920	Prep surface for new fill
Upper Area Terrace	4,840	ln ft	$0.35	$1,694	Surface water conveyance
Riprap Lined Letdown Structures	17	each	$5,000	$85,000	Erosion control feature
QC testing	1	LS	$9,000	$9,000	Earthwork testing
SUBTOTAL				**$940,849**	
Site Restoration					
Surface Water Controls	1	LS	$10,000	$10,000	Drainage modifications
Fine Grading	10	acre	$823	$8,230	Prepare for seeding
Seeding/Fertilizer/Mulch	10	acre	$3,600	$36,000	Native grasses/low maint
Erosion Controls - straw waddles	11,600	ln ft	$3.00	$34,800	Erosion control feature
SUBTOTAL				**$89,030**	
SUBTOTAL				**$1,289,551**	

Table 5-5 (cont)
Site P - Cost Estimate Summary Alternative P3:
Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5)
35 IAC 807 Solid Waste Landfill Cover Over Remainder of Identified Waste Areas, NAPL Collection Well (LEACH P-1), Vapor Intrusion Mitigation, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Asphalt Cover - Nightclub					
Remove/Dispose Exist Pavement	3,560	SY	$9.48	$33,749	Potential source area
Expand Area - Clearing	0.1	acre	$3,000	$300	West perimeter
Expand Area - Fill/Subbase	160	CY	$24.50	$3,920	West perimeter
New Asphalt Pavemt - Total Area	4,040	SY	$17.72	$71,589	Potential source area
SUBTOTAL				**$109,558**	
NAPL Recovery Well (Leach P-1)					
Recovery Well, Pump, Instrmtation	1	LS	$15,000	$15,000	
Power Supply	1	LS	$1,500	$1,500	
Piping and Storage Tank	1	LS	$7,500	$7,500	
Well Pad, Bollards, Misc	1	LS	$1,500	$1,500	
SUBTOTAL				**$25,500**	
SUBTOTAL				**$1,424,608**	
Contingency	25%			$356,152	
SUBTOTAL				**$1,780,760**	
Project Management	6%			$106,846	Percentages based on
Pre-Design Inv/Remedial Design	14%			$249,306	EPA Guidance
Construction Management	8%			$142,461	
Institutional Controls					
Deed Restrictions	1	LS	$7,500	$7,500	
Access Restrictions	1	LS	$7,500	$7,500	
Soil Management Plan	1	LS	$7,500	$7,500	
TOTAL CAPITAL COST				**$2,301,873**	

Table 5-5 (cont)
Site P - Cost Estimate Summary Alternative P3:
Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5)
35 IAC 807 Solid Waste Landfill Cover Over Remainder of Identified Waste Areas, NAPL Collection Well (LEACH P-1), Vapor Intrusion Mitigation, and Institutional Controls

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Soil Cover Maintenance					
Repair Eroded Areas	2	day	$2,500	$5,000	
Repair Vegetative Cover	0.5	acre	$3,600	$1,800	
Maintain Surface Water Controls	2	LS	$1,500	$3,000	
SUBTOTAL				**$9,800**	
Asphalt Crack/Pothole Repair	800	SF	$2.35	$1,880	
NAPL Storage Tank Sampling/Disposal and Reporting	1	LS	$13,000	$13,000	
SUBTOTAL				**$24,680**	
Contingency	30%			$7,404	
SUBTOTAL				**$32,084**	
Project Management	10%			$3,208	
Site Inspections	1	LS	$3,000	$3,000	Two inspections per year
Technical Support	15%			$4,813	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$44,105**	

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Five-Year Review Report					
Year 5	1	LS	$5,000	$5,000	
Year 10	1	LS	$5,000	$5,000	
Year 15	1	LS	$5,000	$5,000	
Year 20	1	LS	$5,000	$5,000	
Year 25	1	LS	$5,000	$5,000	
Year 30	1	LS	$5,000	$5,000	
Update Institutional Controls					
Year 5	1	LS	$2,500	$2,500	
Year 10	1	LS	$2,500	$2,500	
Year 15	1	LS	$2,500	$2,500	
Year 20	1	LS	$2,500	$2,500	
Year 25	1	LS	$2,500	$2,500	
Year 30	1	LS	$2,500	$2,500	

Table 5-5 (cont)
Site P - Cost Estimate Summary Alternative P3:
Asphalt Cover Mobile Source Area (SA-P-3/AT-P-5)
35 IAC 807 Solid Waste Landfill Cover Over Remainder of Identified Waste Areas, NAPL Collection Well (LEACH P-1), Vapor Intrusion Mitigation, and Institutional Controls

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Asphalt Replacement - Nightclub					
Year 10 - Surface Course	4040	SY	$12.05	$48,682	Demo/replace
Year 20 - Surface Course	4040	SY	$12.05	$48,682	Demo/replace
Year 30 - Well Abandonment	1	LS	$2,500	$2,500	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$2,301,873			$2,301,873	1.0000	$2,301,873
1		$44,105		$44,105	0.9346	$41,220
2		$44,105		$44,105	0.8734	$38,523
3		$44,105		$44,105	0.8163	$36,003
4		$44,105		$44,105	0.7629	$33,647
5		$44,105	$7,500	$51,605	0.7130	$36,794
6		$44,105		$44,105	0.6663	$29,389
7		$44,105		$44,105	0.6227	$27,466
8		$44,105		$44,105	0.5820	$25,670
9		$44,105		$44,105	0.5439	$23,990
10		$44,105	$56,182	$100,287	0.5083	$50,981
11		$44,105		$44,105	0.4751	$20,954
12		$44,105		$44,105	0.4440	$19,583
13		$44,105		$44,105	0.4150	$18,302
14		$44,105		$44,105	0.3878	$17,105
15		$44,105	$7,500	$51,605	0.3624	$18,704
16		$44,105		$44,105	0.3387	$14,940
17		$44,105		$44,105	0.3166	$13,963
18		$44,105		$44,105	0.2959	$13,049
19		$44,105		$44,105	0.2765	$12,195
20		$44,105	$56,182	$100,287	0.2584	$25,916
21		$44,105		$44,105	0.2415	$10,652
22		$44,105		$44,105	0.2257	$9,955
23		$44,105		$44,105	0.2109	$9,304
24		$44,105		$44,105	0.1971	$8,695
25		$44,105	$7,500	$51,605	0.1842	$9,508
26		$44,105		$44,105	0.1722	$7,595
27		$44,105		$44,105	0.1609	$7,098
28		$44,105		$44,105	0.1504	$6,633
29		$44,105		$44,105	0.1406	$6,200
30		$44,105	$20,000	$64,105	0.1314	$8,421
Totals	$2,301,873	$1,323,150	$154,864	$3,779,887		**$2,904,328**
Rounded Totals (Millions)	$2.3 M	$1.3 M	$0.15 M	$3.8 M		**$2.9 M**

Table 5-7
Site Q North - Cost Estimate Summary Alternative QN2: 35 IAC 724 Compliant Crushed Rock Cover Over Dogleg Area, Vapor Intrusion Migitation, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$64,353**	Cap costs w/o contingency
Construction Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post-Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Q North Dogleg Area					
Site Preparation					
Construction Staking	5	day	$1,675	$8,375	
Temp Relocation/Landscape Mat'ls	5,300	pallets	$4.25	$22,525	6.5 acre pallet storage
SUBTOTAL				**$30,900**	
Crushed Rock Cover					
12-inch crushed rock layer	19,400	CY	$25.10	$486,940	Assume 9" new, 3" existing
Drainage Modifications	1	LS	$20,000	$20,000	Runon/runoff controls
Existing Utility Modifications	1	LS	$20,000	$20,000	Raise manholes, etc
Special Precautions - Exist Bldgs	1	LS	$20,000	$20,000	Prevent "bath tub" effects
QC testing	1	LS	$5,000	$5,000	Earthwork testing
SUBTOTAL				**$551,940**	
Site Restoration					
Fine Grading	16	acre	$823	$13,168	
Return Relocated Materials to Area	5,300	pallets	$4.25	$22,525	
SUBTOTAL				**$35,693**	
Vapor Intrusion Mitigation (pole barn only)	1	LS	$25,000	**$25,000**	
SUBTOTAL				**$707,886**	
Contingency	25%			$176,972	
SUBTOTAL				**$884,858**	
Project Management	6%			$42,473	Percentages based on
Pre-Design Inv/Remedial Design	14%			$99,104	EPA Guidance
Construction Management	8%			$56,631	
Institutional Controls					
Deed Restrictions	1	LS		$7,500	
Access Restrictions	1	LS		$7,500	
Soil Management Plan	1	LS		$7,500	
TOTAL CAPITAL COST				**$1,105,566**	

Table 5-7 (cont)
Site Q North - Cost Estimate Summary Alternative QN2:
35 IAC 724 Compliant Crushed Rock Cover Over Dogleg Area, Vapor Intrusion Migitation, and Institutional Controls

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Crushed Rock Cover Maintenance					
Repair Erosion/Disturbance	1	LS	$2,500	$2,500	Minor erosion expected
Maintain Surface Water Controls	1	LS	$2,500	$2,500	Minor effort expected
SUBTOTAL				$5,000	
Contingency	30%			$1,500	
SUBTOTAL				**$6,500**	
Project Management	10%			$650	
Site Inspections/Reporting	1	LS	$3,000	$3,000	Two inspections per year
Technical Support	15%			$975	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$12,125**	

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Five-Year Review Report					
Year 5	1	LS	$2,500	$2,500	
Year 10	1	LS	$2,500	$2,500	
Year 15	1	LS	$2,500	$2,500	
Year 20	1	LS	$2,500	$2,500	
Year 25	1	LS	$2,500	$2,500	
Year 30	1	LS	$2,500	$2,500	
Update Institutional Controls					
Year 5	1	LS	$5,000	$5,000	
Year 10	1	LS	$5,000	$5,000	
Year 15	1	LS	$5,000	$5,000	
Year 20	1	LS	$5,000	$5,000	
Year 25	1	LS	$5,000	$5,000	
Year 30	1	LS	$5,000	$5,000	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

Table 5-7 (cont)
Site Q North - Cost Estimate Summary Alternative QN2:
35 IAC 724 Compliant Crushed Rock Cover Over Dogleg Area, Vapor Intrusion Migitation, and Institutional Controls

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$1,105,566			$1,105,566	1.0000	$1,105,566
1		$12,125		$12,125	0.9346	$11,332
2		$12,125		$12,125	0.8734	$10,590
3		$12,125		$12,125	0.8163	$9,898
4		$12,125		$12,125	0.7629	$9,250
5		$12,125	$7,500	$19,625	0.7130	$13,992
6		$12,125		$12,125	0.6663	$8,079
7		$12,125		$12,125	0.6227	$7,551
8		$12,125		$12,125	0.5820	$7,057
9		$12,125		$12,125	0.5439	$6,595
10		$12,125	$7,500	$19,625	0.5083	$9,976
11		$12,125		$12,125	0.4751	$5,761
12		$12,125		$12,125	0.4440	$5,384
13		$12,125		$12,125	0.4150	$5,031
14		$12,125		$12,125	0.3878	$4,702
15		$12,125	$7,500	$19,625	0.3624	$7,113
16		$12,125		$12,125	0.3387	$4,107
17		$12,125		$12,125	0.3166	$3,838
18		$12,125		$12,125	0.2959	$3,587
19		$12,125		$12,125	0.2765	$3,353
20		$12,125	$7,500	$19,625	0.2584	$5,071
21		$12,125		$12,125	0.2415	$2,928
22		$12,125		$12,125	0.2257	$2,737
23		$12,125		$12,125	0.2109	$2,558
24		$12,125		$12,125	0.1971	$2,390
25		$12,125	$7,500	$19,625	0.1842	$3,616
26		$12,125		$12,125	0.1722	$2,088
27		$12,125		$12,125	0.1609	$1,951
28		$12,125		$12,125	0.1504	$1,824
29		$12,125		$12,125	0.1406	$1,704
30		$12,125	$17,500	$29,625	0.1314	$3,892
Totals	$1,105,566	$363,750	$55,000	$1,524,316		**$1,273,523**
Rounded Totals (Millions)	$1.1 M	$0.36 M	$0.055 M	$1.5 M		**$1.3 M**

Table 5-12
Site Q Central - Cost Estimate Summary Alternative QC3: 35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, SVE at Mobile Source Area (AT-Q32), Shoreline Erosion Protection, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$144,712**	Cap costs w/o contingency
Construction Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post-Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Site Preparation					
Construction Staking	10	day	$1,675	$16,750	
Temp Relocation Existing Bulk Matls	78,000	CY	$2	$156,000	
Temp Relocation Exist Palletized Mat'ls	2,500	pallets	$4.25	$10,625	Assume minor relocation
Clea/Grub Shoreline Area	0.5	acre	$3,000	$1,500	Assume minor clearing
SUBTOTAL				**$184,875**	
Crushed Rock Cover (Placed Over 20% of Total Waste Area)					
12-inch crushed rock layer	16,300	CY	$25.10	$409,130	Assume 9" new, 3" existing
Drainage Modifications	1	LS	$50,000	$50,000	Assume minor modifications
Existing Utility Modifications	1	LS	$30,000	$30,000	Assume minor modifications
Special Precautions - Exist Bldgs	1	LS	$20,000	$20,000	Assume minor modifications
QC testing	1	LS	$11,000	$11,000	Earthwork testing
SUBTOTAL				**$520,130**	
Shoreline Protection (470 ln ft x 60 ft wide)					
General Grading/Shaping	1	acre	$5,000	$5,000	
Riprap Placement	2090	CY	$100	$209,000	
SUBTOTAL				**$214,000**	
Site Restoration					
Fine Grading - Gravel Areas	13.5	acre	$823	$11,111	
Return Relocated Materials to Area	1	LS	$167,000	$167,000	Assume minor effort
SUBTOTAL				**$178,111**	
Soil Vapor Extraction System					
Surface Water/Sediment Sampling	1	LS	$25,000	$25,000	Evaluate need for SVE
Extraction Wells, Bldg, Utilities	1	LS	$125,000	$125,000	
Process/Treatment Systems	1	LS	$150,000	$150,000	
Startup/Testing	1	LS	$50,000	$50,000	
SUBTOTAL				**$350,000**	
SUBTOTAL				**$1,591,827**	
Contingency	25%			$397,957	
SUBTOTAL				**$1,989,784**	

Table 5-12 (cont)
Site Q Central - Cost Estimate Summary Alternative QC3:
35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, SVE at Mobile Source Area (AT-Q32), Shoreline Erosion Protection, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Project Management	5%			$99,489	Percentages based on
Pre-Design Inv/Remedial Design	10%			$198,978	EPA Guidance
Construction Management	6%			$119,387	
Institutional Controls					
Deed Restrictions	1	LS		$7,500	
Access Restrictions	1	LS		$7,500	
Soil Management Plan	1	LS		$7,500	
SW/Sed Sampling for SVE	5	/sample	$2,000	$10,000	
TOTAL CAPITAL COST				**$2,440,138**	

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Gravel Cover Maintenance					
Repair Erosion/Disturbance	1	LS	$4,000	$4,000	
Maintain Drainage Modifications	1	LS	$4,000	$4,000	
SUBTOTAL				$8,000	
Contingency	30%			$2,400	
SUBTOTAL				**$10,400**	
Project Management	10%			$1,040	
Site Inspections/Reporting	1	LS	$3,000	$3,000	Two inspections per year
Technical Support	15%			$1,560	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$17,000**	

Table 5-12 (cont)
Site Q Central - Cost Estimate Summary Alternative QC3:
35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, SVE at Mobile Source Area (AT-Q32), Shoreline Erosion Protection, and Institutional Controls

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SVE System					
Year 1 - O&M	1	LS	$50,000	$50,000	
Year 2 - O&M	1	LS	$50,000	$50,000	
Year 3 - O&M	1	LS	$50,000	$50,000	
Year 4 - Closeout	1	LS	$25,000	$25,000	
Five-Year Review Report					
Year 5	1	LS	$2,500	$2,500	
Year 10	1	LS	$2,500	$2,500	
Year 15	1	LS	$2,500	$2,500	
Year 20	1	LS	$2,500	$2,500	
Year 25	1	LS	$2,500	$2,500	
Year 30	1	LS	$2,500	$2,500	
Update Institutional Controls					
Year 5	1	LS	$5,000	$5,000	
Year 10	1	LS	$5,000	$5,000	
Year 15	1	LS	$5,000	$5,000	
Year 20	1	LS	$5,000	$5,000	
Year 25	1	LS	$5,000	$5,000	
Year 30	1	LS	$5,000	$5,000	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

Table 5-12 (cont)
Site Q Central - Cost Estimate Summary Alternative QC3:
35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, SVE at Mobile Source Area (AT-Q32), Shoreline Erosion Protection, and Institutional Controls

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$2,440,138			$2,440,138	1.0000	$2,440,138
1		$17,000	$50,000	$67,000	0.9346	$62,617
2		$17,000	$50,000	$67,000	0.8734	$58,520
3		$17,000	$50,000	$67,000	0.8163	$54,692
4		$17,000	$25,000	$42,000	0.7629	$32,042
5		$17,000	$7,500	$24,500	0.7130	$17,468
6		$17,000		$17,000	0.6663	$11,328
7		$17,000		$17,000	0.6227	$10,587
8		$17,000		$17,000	0.5820	$9,894
9		$17,000		$17,000	0.5439	$9,247
10		$17,000	$7,500	$24,500	0.5083	$12,455
11		$17,000		$17,000	0.4751	$8,077
12		$17,000		$17,000	0.4440	$7,548
13		$17,000		$17,000	0.4150	$7,054
14		$17,000		$17,000	0.3878	$6,593
15		$17,000	$7,500	$24,500	0.3624	$8,880
16		$17,000		$17,000	0.3387	$5,758
17		$17,000		$17,000	0.3166	$5,382
18		$17,000		$17,000	0.2959	$5,030
19		$17,000		$17,000	0.2765	$4,701
20		$17,000	$7,500	$24,500	0.2584	$6,331
21		$17,000		$17,000	0.2415	$4,106
22		$17,000		$17,000	0.2257	$3,837
23		$17,000		$17,000	0.2109	$3,586
24		$17,000		$17,000	0.1971	$3,351
25		$17,000	$7,500	$24,500	0.1842	$4,514
26		$17,000		$17,000	0.1722	$2,927
27		$17,000		$17,000	0.1609	$2,736
28		$17,000		$17,000	0.1504	$2,557
29		$17,000		$17,000	0.1406	$2,390
30		$17,000	$17,500	$34,500	0.1314	$4,532
Totals	$2,440,138	$510,000	$230,000	$3,180,138		**$2,818,878**
Rounded Totals (Millions)	$2.4 M	$0.51 M	$0.23 M	$3.2 M		**$2.8 M**

Table 5-15
Site Q South - Cost Estimate Summary Alternative QS3:
35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, Removal of Intact Drums at AT-Q35, and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$254,985**	Cap costs w/o contingency
Constr Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post-Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Site Preparation					
Construction Staking	7	day	$1,675	$11,725	Survey crew
Tree Clearing (No Grubbing)	10	acre	$3,000	$30,000	Minimize soil disturbance
Haul/Dispose of Cleared Trees	40	loads	$90	$3,600	Load, haul, dispose
Brush Mowing	21	acre	$530	$11,130	Medium density
Erosion Repair	3,500	CY	$18.45	$64,575	Fill/regrade gulleys
Temporary Drainage Controls	2,400	ln ft	$1.26	$3,024	Silt fencing/disturbed areas
SUBTOTAL				**$124,054**	
Armored Cover					
12-inch Riprap Layer	34,400	CY	$68.00	$2,339,200	Load, haul, place
Fill for Base Contours	1	CY	$0.00	$0	Assume construction debris
QC testing	1	LS	$23,000	$23,000	Earthwork testing
SUBTOTAL				**$2,362,200**	
Site Restoration					
Surface Water Controls	1	LS	$50,000	$50,000	Drainage modifications
Seeding/Fertilizer/Mulch	1	acre	$3,600	$3,600	Minor areas
Erosion Controls	1	LS	$10,000.00	$10,000	
SUBTOTAL				**$63,600**	
Intact Drum Removal					
Excavation, Disposal, Backfilling	2	drums	$10,000	**$20,000**	
SUBTOTAL				**$2,824,839**	
Contingency	25%			$706,210	
SUBTOTAL				**$3,531,049**	
Project Management	5%			$176,552	Percentages based on
Pre-Design Inv/Remedial Design	10%			$353,105	EPA Guidance
Construction Management	6%			$211,863	
Institutional Controls					
Deed Restrictions	1	LS	$7,500	$7,500	
Access Restrictions	1	LS	$7,500	$7,500	
Soil Management Plan	1	LS	$7,500	$7,500	
TOTAL CAPITAL COST				**$4,295,070**	

Table 5-15 (cont)
Site Q South - Cost Estimate Summary Alternative QS3:
35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, Removal of Intact Drums at AT-Q35, and Institutional Controls

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Armored Cover Maintenance					
Maintain Surface Water Controls	1	LS	$3,500	$3,500	
SUBTOTAL				**$3,500**	
Contingency	30%			$1,050	
SUBTOTAL				**$4,550**	
Project Management	10%			$455	
Site Inspections	1	LS	$3,000	$3,000	Two inspections per year
Technical Support	15%			$683	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$9,688**	

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Armored Cover Maintenance					
Repair Eroded Areas - Year 10	1,000	CY	$68	$68,000	
Repair Eroded Areas - Year 20	1,000	CY	$68	$68,000	
Five-Year Review Report					
Year 5	1	LS	$5,000	$5,000	
Year 10	1	LS	$5,000	$5,000	
Year 15	1	LS	$5,000	$5,000	
Year 20	1	LS	$5,000	$5,000	
Year 25	1	LS	$5,000	$5,000	
Year 30	1	LS	$5,000	$5,000	
Update Institutional Controls					
Year 5	1	LS	$2,500	$2,500	
Year 10	1	LS	$2,500	$2,500	
Year 15	1	LS	$2,500	$2,500	
Year 20	1	LS	$2,500	$2,500	
Year 25	1	LS	$2,500	$2,500	
Year 30	1	LS	$2,500	$2,500	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

Table 5-15 (cont)
Site Q South - Cost Estimate Summary Alternative QS3:
35 IAC Compliant Crushed Rock Cover Over Identified Waste Areas, Removal of Intact Drums at AT-Q35, and Institutional Controls

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$4,295,070	$9,688		$4,304,757	1.0000	$4,304,757
1		$9,688		$9,688	0.9346	$9,054
2		$9,688		$9,688	0.8734	$8,461
3		$9,688		$9,688	0.8163	$7,908
4		$9,688		$9,688	0.7629	$7,391
5		$9,688	$7,500	$17,188	0.7130	$12,254
6		$9,688		$9,688	0.6663	$6,455
7		$9,688		$9,688	0.6227	$6,033
8		$9,688		$9,688	0.5820	$5,638
9		$9,688		$9,688	0.5439	$5,269
10		$9,688	$75,500	$85,188	0.5083	$43,305
11		$9,688		$9,688	0.4751	$4,602
12		$9,688		$9,688	0.4440	$4,301
13		$9,688		$9,688	0.4150	$4,020
14		$9,688		$9,688	0.3878	$3,757
15		$9,688	$7,500	$17,188	0.3624	$6,230
16		$9,688		$9,688	0.3387	$3,281
17		$9,688		$9,688	0.3166	$3,067
18		$9,688		$9,688	0.2959	$2,866
19		$9,688		$9,688	0.2765	$2,679
20		$9,688	$75,500	$85,188	0.2584	$22,014
21		$9,688		$9,688	0.2415	$2,340
22		$9,688		$9,688	0.2257	$2,187
23		$9,688		$9,688	0.2109	$2,044
24		$9,688		$9,688	0.1971	$1,910
25		$9,688	$7,500	$17,188	0.1842	$3,167
26		$9,688		$9,688	0.1722	$1,668
27		$9,688		$9,688	0.1609	$1,559
28		$9,688		$9,688	0.1504	$1,457
29		$9,688		$9,688	0.1406	$1,362
30		$9,688	$17,500	$27,188	0.1314	$3,572
Totals	$4,295,070	$300,313	$191,000	$4,786,382		**$4,494,607**
Rounded Totals (Millions)	$4.3 M	$0.30 M	$0.19 M	$4.8 M		**$4.5 M**

Table 5-17
Site R - Cost Estimate Summary Alternative R2:
35 IAC 724 Compliant Soil Cover
Over Entire Site, and Instutitional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$100,647**	Cap costs w/o contingency
Constr Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post-Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Soil Cover - Waste Areas					
Site Preparation					
Construction Staking	3	day	$1,675	$5,025	Survey crew
Redistribute Trench Spoil Stockpile	19,200	CY	$2.00	$38,400	240' x 540' x 4'
Brush Mowing	21	acre	$530	$11,130	Medium density
Temporary Drainage Controls	5,200	ln ft	$1.26	$6,552	Perimeter silt fencing
SUBTOTAL				**$61,107**	
Soil Cover					Assume no base fill needed
Cover Soil (amended)	20,600	CY	$23.85	$491,310	Import, spread
Cover Soil	20,600	CY	$14.75	$303,850	Combine with existing cover
Scarify Existing Grnd Surface	24	acre	592	$14,208	Prep surface for new fill
QC testing	1	LS	$8,000	$8,000	Earthwork testing
SUBTOTAL				**$817,368**	
Site Restoration					
Surface Water Controls	5,200	ln ft	$2.50	$13,000	Drainage modifications
Fine Grading	26	acre	$823	$21,398	Prepare for seeding
Seeding/Fertilizer/Mulch	26	acre	$3,600	$93,600	Native grasses/low maint
SUBTOTAL				**$127,998**	
SUBTOTAL				**$1,107,120**	
Contingency	25%			$276,780	
SUBTOTAL				**$1,383,900**	
Project Management	5%			$69,195	Percentages based on
Pre-Design Inv/Remedial Design	10%			$138,390	EPA Guidance
Construction Management	6%			$83,034	
Institutional Controls					
Deed Restrictions	1	LS	$7,500	$7,500	
Access Restrictions	1	LS	$7,500	$7,500	
Soil Management Plan	1	LS	$7,500	$7,500	
TOTAL CAPITAL COST				**$1,697,019**	

Table 5-17 (cont)
Site R - Cost Estimate Summary Alternative R2:
35 IAC 724 Compliant Soil Cover
Over Entire Site, and Instutitional Controls

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Soil Cover Maintenance					
Repair Eroded Areas	2	day	$2,500	$5,000	Equipment & materials
Repair Vegetative Cover	1	acre	$3,600	$3,600	5% spot seeding/year
Maintain Surface Water Controls	1	LS	$2,500	$2,500	
SUBTOTAL				**$11,100**	
Contingency	30%			$3,330	
SUBTOTAL				**$14,430**	
Project Management	10%			$1,443	
Site Inspections	1	LS	$3,000	$3,000	Two inspections per year
Technical Support	15%			$2,165	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$22,038**	

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Five-Year Review Report					
Year 5	1	LS	$5,000	$5,000	
Year 10	1	LS	$5,000	$5,000	
Year 15	1	LS	$5,000	$5,000	
Year 20	1	LS	$5,000	$5,000	
Year 25	1	LS	$5,000	$5,000	
Year 30	1	LS	$5,000	$5,000	
Update Institutional Controls					
Year 5	1	LS	$2,500	$2,500	
Year 10	1	LS	$2,500	$2,500	
Year 15	1	LS	$2,500	$2,500	
Year 20	1	LS	$2,500	$2,500	
Year 25	1	LS	$2,500	$2,500	
Year 30	1	LS	$2,500	$2,500	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

Table 5-17 (cont)
Site R - Cost Estimate Summary Alternative R2:
35 IAC 724 Compliant Soil Cover
Over Entire Site, and Instutitional Controls

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$1,697,019	$22,038		$1,719,057	1.0000	$1,719,057
1		$22,038		$22,038	0.9346	$20,596
2		$22,038		$22,038	0.8734	$19,248
3		$22,038		$22,038	0.8163	$17,989
4		$22,038		$22,038	0.7629	$16,812
5		$22,038	$7,500	$29,538	0.7130	$21,060
6		$22,038		$22,038	0.6663	$14,685
7		$22,038		$22,038	0.6227	$13,724
8		$22,038		$22,038	0.5820	$12,826
9		$22,038		$22,038	0.5439	$11,987
10		$22,038	$7,500	$29,538	0.5083	$15,015
11		$22,038		$22,038	0.4751	$10,470
12		$22,038		$22,038	0.4440	$9,785
13		$22,038		$22,038	0.4150	$9,145
14		$22,038		$22,038	0.3878	$8,547
15		$22,038	$7,500	$29,538	0.3624	$10,706
16		$22,038		$22,038	0.3387	$7,465
17		$22,038		$22,038	0.3166	$6,977
18		$22,038		$22,038	0.2959	$6,520
19		$22,038		$22,038	0.2765	$6,094
20		$22,038	$7,500	$29,538	0.2584	$7,633
21		$22,038		$22,038	0.2415	$5,322
22		$22,038		$22,038	0.2257	$4,974
23		$22,038		$22,038	0.2109	$4,649
24		$22,038		$22,038	0.1971	$4,345
25		$22,038	$7,500	$29,538	0.1842	$5,442
26		$22,038		$22,038	0.1722	$3,795
27		$22,038		$22,038	0.1609	$3,547
28		$22,038		$22,038	0.1504	$3,314
29		$22,038		$22,038	0.1406	$3,098
30		$22,038	$17,500	$39,538	0.1314	$5,194
Totals	$1,697,019	$683,163	$55,000	$2,435,182		**$2,010,018**
Rounded Totals (Millions)	$1.7 M	$0.68 M	$0.055 M	$2.4 M		**$2.0 M**

Table 5-20
Site S - Cost Estimate Summary Alternative S3: In-Situ Treatment (SVE) of Mobile Source Area, 35 IAC 724 Compliant Vegetated Soil Cover Over Entire Site and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	1	LS	10%	**$43,162**	Cap costs w/o contingency
Constr Equip/Facilities/Utilities					Equip, trailer, utilities
Pre-Work/Post Constr Submittals					Work Plan, dwgs, etc
GC Admin/Home Office/Profit					
Site Preparation					
Construction Staking	1	day	$1,675	$1,675	Survey crew
Tree Clearing (No Grubbing)	0.5	acre	$3,000	$1,500	Minimize soil disturbance
Haul/Dispose of Cleared Trees	2	loads	$90	$180	Load, haul, dispose
Brush Mowing	0.5	acre	$530	$265	Medium density
Remove Exist Fence	1	LS	$1,000	$1,000	
Remove Exist Asphalt Pavmt	1,940	SF	$9.48	$18,391	
Temporary Drainage Controls	1,000	ln ft	$1.26	$1,260	Perimeter silt fencing
SUBTOTAL				**$24,271**	
Soil Cover					Assume no base fill needed
Cover Soil (amended)	800	CY	$23.85	$19,080	Import, spread
Cover Soil	2,400	CY	$14.75	$35,400	Combine with existing cover
Scarify Existing Grnd Surface	1	acre	$592	$592	Prep surface for new fill
QC testing	1	LS	$1,000	$1,000	Earthwork testing
SUBTOTAL				**$56,072**	
Soil Vapor Extraction System					
Extraction Wells, Bldg, Utilities	1	LS	$125,000	$125,000	
Process/Treatment Systems	1	LS	$150,000	$150,000	
Startup/Testing	1	LS	$50,000	$50,000	
SUBTOTAL				**$325,000**	
Site Restoration					
Surface Water Controls	1	LS	$2,500	$2,500	Drainage modifications
Fine Grading	1	acre	$823	$823	Prepare for seeding
Seeding/Fertilizer/Mulch	1	acre	$3,600	$3,600	Native grasses/low maint
Replace Fence	645	ln ft	$30	$19,350	
SUBTOTAL				**$26,273**	
SUBTOTAL				**$474,778**	
Contingency	25%			$118,694	
SUBTOTAL				**$593,472**	

Table 5-20 (cont)
Site S - Cost Estimate Summary Alternative S3:
In-Situ Treatment (SVE) of Mobile Source Area,
35 IAC 724 Compliant Vegetated Soil Cover Over Entire Site
and Institutional Controls

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Project Management	6%			$35,608	Percentages based on
Pre-Design Inv/Remedial Design	14%			$83,086	EPA Guidance
Construction Management	8%			$47,478	
Institutional Controls					
Deed Restrictions	1	LS	$7,500	$7,500	
Access Restrictions	1	LS	$7,500	$7,500	
Soil Management Plan	1	LS	$7,500	$7,500	
TOTAL CAPITAL COST				**$782,145**	

ANNUAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Soil Cover Maintenance					
Repair Eroded Areas	0.5	day	$2,500	$1,250	Equipment & materials
Repair Vegetative Cover	0.1	acre	$3,600	$360	10% spot seeding/year
Maintain Surface Water Controls	1	LS	$750	$750	
SUBTOTAL				**$2,360**	
SUBTOTAL				**$2,360**	
Contingency	30%			$708	
SUBTOTAL				**$3,068**	
Project Management	10%			$307	
Site Inspections	1	LS	$2,000	$2,000	Two inspections per year
Technical Support	15%			$460	
Institutional Controls Database	1	LS	$1,000	$1,000	Annual update
TOTAL ANNUAL COSTS				**$6,835**	

Table 5-20 (cont)
Site S - Cost Estimate Summary Alternative S3:
In-Situ Treatment (SVE) of Mobile Source Area,
35 IAC 724 Compliant Vegetated Soil Cover Over Entire Site
and Institutional Controls

PERIODIC COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SVE System					
Year 1 - O&M	1	LS	$50,000	$50,000	
Year 2 - O&M	1	LS	$50,000	$50,000	
Year 3 - O&M	1	LS	$50,000	$50,000	
Year 4 - Closeout	1	LS	$25,000	$25,000	
Five-Year Review Report					
Year 5	1	LS	$1,500	$1,500	
Year 10	1	LS	$1,500	$1,500	
Year 15	1	LS	$1,500	$1,500	
Year 20	1	LS	$1,500	$1,500	
Year 25	1	LS	$1,500	$1,500	
Year 30	1	LS	$1,500	$1,500	
Update Institutional Controls					
Year 5	1	LS	$1,500	$1,500	
Year 10	1	LS	$1,500	$1,500	
Year 15	1	LS	$1,500	$1,500	
Year 20	1	LS	$1,500	$1,500	
Year 25	1	LS	$1,500	$1,500	
Year 30	1	LS	$1,500	$1,500	
Remedial Action Report (Year 30)	1	LS	$10,000	$10,000	

Table 5-20 (cont)
Site S - Cost Estimate Summary Alternative S3:
In-Situ Treatment (SVE) of Mobile Source Area,
35 IAC 724 Compliant Vegetated Soil Cover Over Entire Site
and Institutional Controls

PRESENT VALUE ANALYSIS:

Year	Capital Costs	Annual Costs	Periodic Costs	Total Cost	Discount Factor 7%	Total Present Value
0	$782,145			$782,145	1.0000	$782,145
1		$6,835	$50,000	$56,835	0.9346	$53,117
2		$6,835	$50,000	$56,835	0.8734	$49,642
3		$6,835	$50,000	$56,835	0.8163	$46,394
4		$6,835	$25,000	$31,835	0.7629	$24,287
5		$6,835	$3,000	$9,835	0.7130	$7,012
6		$6,835		$6,835	0.6663	$4,554
7		$6,835		$6,835	0.6227	$4,256
8		$6,835		$6,835	0.5820	$3,978
9		$6,835		$6,835	0.5439	$3,718
10		$6,835	$3,000	$9,835	0.5083	$5,000
11		$6,835		$6,835	0.4751	$3,247
12		$6,835		$6,835	0.4440	$3,035
13		$6,835		$6,835	0.4150	$2,836
14		$6,835		$6,835	0.3878	$2,651
15		$6,835	$3,000	$9,835	0.3624	$3,565
16		$6,835		$6,835	0.3387	$2,315
17		$6,835		$6,835	0.3166	$2,164
18		$6,835		$6,835	0.2959	$2,022
19		$6,835		$6,835	0.2765	$1,890
20		$6,835	$3,000	$9,835	0.2584	$2,542
21		$6,835		$6,835	0.2415	$1,651
22		$6,835		$6,835	0.2257	$1,543
23		$6,835		$6,835	0.2109	$1,442
24		$6,835		$6,835	0.1971	$1,347
25		$6,835	$3,000	$9,835	0.1842	$1,812
26		$6,835		$6,835	0.1722	$1,177
27		$6,835		$6,835	0.1609	$1,100
28		$6,835		$6,835	0.1504	$1,028
29		$6,835		$6,835	0.1406	$961
30		$6,835	$13,000	$19,835	0.1314	$2,606
Totals	$782,145	$205,050	$203,000	$1,190,195		**$1,025,036**
Rounded Totals (Millions)	$0.78 M	$0.21 M	$0.20 M	$1.2 M		**$1.0 M**

APPENDIX D

RISK CHARACTERIZATION SUMMARY TABLES

Table 1
Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Contaminant of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
1,2,4-Trichlorobenzene	NA	NA	NA	D	IRIS	3/08
1,2-Dichloroethane	9.10E-02	9.10E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	3/08
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	5.40E-03	5.40E-03	$(mg/kg\text{-}day)^{-1}$	NA	CalEPA	1/08
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA
4,4'-DDT	3.40E-01	3.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	3/08
4-Chloroaniline	5.40E-02	5.40E-02	$(mg/kg\text{-}day)^{-1}$	C	PPRTV	9/30/02
Arsenic	1.50E+00	1.50E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	3/08
Benzene	3.35E-02(a)	3.35E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	3/08
Benzo(a)pyrene	7.30E+00	7.30E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	3/08
Benzo(b)fluoranthene	7.30E-01	7.30E-01	$(mg/kg\text{-}day)^{-1}$	B2		(b)
Benzo(k)fluoranthene	7.30E-02	7.30E-02	$(mg/kg\text{-}day)^{-1}$	B2		(c)
Cadmium	NA	NA	NA	B1	IRIS	3/08
Chlorobenzene	NA	NA	NA	D	IRIS	3/08
Chloroform	NA	NA	NA	B2		(d)
Chloromethane	NA	NA	NA	D	IRIS	3/08
Dibenzo(a,h)anthracene	7.30E+00	7.30E+00	$(mg/kg\text{-}day)^{-1}$	B2		(e)
Dieldrin	1.60E+01	1.60E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	3/08
Dioxin TEQ-HH	1.50E+05	1.50E+05	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	1997
Lead	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	D	IRIS	3/08
MCPA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	C	IRIS	3/08
PCBs, Total	2.00E+00	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	3/08
Pentachlorophenol	1.20E-01	1.20E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	3/08
Tetrachloroethene	5.40E-01	5.40E-01	$(mg/kg\text{-}day)^{-1}$	NA	CalEPA	1/08
Toluene	NA	NA	NA	D	IRIS	3/08
Trichloroethene	1.30E-02	1.30E-02	$(mg/kg\text{-}day)^{-1}$	NA	CalEPA	1/08
Xylenes, Total	NA	NA	NA	NA	NA	NA

Pathway: Inhalation

Contaminant of Concern	Unit Risk	Units	Inhalation Cancer Slope factor(f)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
1,2,4-Trichlorobenzene	NA	NA	NA	$(mg\text{-}kg/day)^{-1}$	D	IRIS	3/08
1,2-Dichloroethane	2.60E-05	$(\mu g/m^3)^{-1}$	9.10E-02	$(mg\text{-}kg/day)^{-1}$	B2	IRIS	3/08
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.10E-05	$(\mu g/m^3)^{-1}$	4.00E-02	$(mg\text{-}kg/day)^{-1}$	NA	CalEPA	1/08
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
Benzene	2.2E-06 – 7.8E-06 (a)	$(\mu g/m^3)^{-1}$	1.74E-02	$(mg\text{-}kg/day)^{-1}$	A	IRIS	3/08
Cadmium	1.80E-03	$(\mu g/m^3)^{-1}$	6.30E+00	$(mg\text{-}kg/day)^{-1}$	B1	IRIS	3/08
Chlorobenzene	NA	NA	NA	NA	D	IRIS	3/08
Chloroform	2.30E-05	$(\mu g/m^3)^{-1}$	8.05E-02	$(mg\text{-}kg/day)^{-1}$	B2	IRIS	3/08
Chloromethane	NA	NA	NA	NA	D	IRIS	3/08
Naphthalene	NA	NA	NA	NA	C	IRIS	3/08
Tetrachloroethene	5.90E-06	$(\mu g/m^3)^{-1}$	2.10E-02	$(mg\text{-}kg/day)^{-1}$	NA	CalEPA	1/08
Toluene	NA	NA	NA	NA	D	IRIS	3/08
Trichloroethene	2.00E-06	$(\mu g/m^3)^{-1}$	7.00E-03	$(mg\text{-}kg/day)^{-1}$	NA	CalEPA	1/08
Xylenes, Total	NA	NA	NA	NA	NA	NA	NA

Notes:
NA: Not available
IRIS: Integrated Risk Information System, EPA
PPRTV: Provisional Peer Reviewed Toxicity Values
CalEPA – California EPA
HEAST – Health Effects Assessment Summary Tables
PCB: Polychlorinated Biphenyls
Dioxin TEQ-HH - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration for Human Health
MCPA - 2-methyl-4-chlorophenoxyacetic acid
(a) - IRIS provides a range of CSFs and inhalation unit risks for benzene of (CSF 1.5E-02 to 5.5E-02 kg*day/mg and IUR 2.2E-06 to 7.8E-06 m^3/ug) . The midpoint of the range is therefore used in the calculations.
(b) CSF based on that for benzo(a)pyrene and applying a RPF of 0.1 per USEPA (1993b).
(c) CSF based on that for benzo(a)pyrene and applying a RPF of 0.01 per USEPA (1993b).
(d) The oral reference dose is considered protective of potential carcinogenic effects (IRIS, 3/08).
(e) CSF based on that for benzo(a)pyrene and applying a RPF of 1 per USEPA (1993b).
(f) – Converted from unit risk factor: Unit Risk Factor (m^3/ug) x (70 kg x ($1day/20m^3$) x 1000 ug/mg).

A- Known Human Carcinogen
B1- Probable human carcinogen - indicates that limited human data are available.
B2- Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C- Possible human carcinogen
D- Not classifiable as a human carcinogen
E- Evidence of non-carcinogenicity

Table 2
Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Contaminant of Concern	Chronic / Subchronic	Oral RfD value	Oral RfD Units	Dermal RfD Value	Dermal RfD Units	Primary Target Organ	Combined UF/MF	Sources of RfD Target Organ	Date
1,2,4-Trichlorobenzene	Chronic	1.00E-02	mg/kg	1.00E-02	mg/kg	Increased Adrenal Weights; Vacuolization of Zona Fasciculata in the Cortex	1000 / 1	IRIS	3/08
1,2,4-Trichlorobenzene	Subchronic	1.00E-01	mg/kg	1.00E-01	mg/kg	Increased Adrenal Weights; Vacuolization of Zona Fasciculata in the Cortex	100 / 1 (2)	IRIS	3/08
1,2-Dichloroethane	Chronic	2.00E-02	mg/kg	2.00E-02	mg/kg	Increased Kidney Weight	3000 / 1	PPRTV	10/02
1,2-Dichloroethane	Subchronic	2.00E-01	mg/kg	2.00E-01	mg/kg	Increased Kidney Weight	300 / 1 (2)	PPRTV	10/02
1,2-Dichloroethene (total)	Chronic	2.00E-02 (a)	mg/kg	2.00E-02	mg/kg	Increased Serum Phosphates	1000 / 1	IRIS	3/08
1,2-Dichloroethene (total)	Subchronic	2.00E-01	mg/kg	2.00E-01	mg/kg	Increased Serum Phosphates	100 / 1 (2)	IRIS	3/08
1,4-Dichlorobenzene	Chronic	3.00E-02 (b)	mg/kg	3.00E-02	mg/kg	Liver Perturbations and Developmental Toxicity Effects	1000	PPRTV	4/29/97
1,4-Dichlorobenzene	Subchronic	7.00E-02	mg/kg	7.00E-02	mg/kg	Liver	100	ATSDR	11/07
2,4-Dichlorophenol	Chronic / Subchronic	3.00E-03	mg/kg	3.00E-03	mg/kg	Decreased Delayed Hypersensitivity Response	100 / 1	IRIS	3/08
2-Methylnaphthalene	Chronic / Subchronic (chr)	4.00E-03	mg/kg	4.00E-03	mg/kg	Pulmonary Alveolar Proteinosis	1000 / 1	IRIS	3/08
4,4'-DDT	Chronic / Subchronic	5.00E-04	mg/kg	5.00E-04	mg/kg	Liver Lesions	100 / 1	IRIS	3/08
4-Chloroaniline	Chronic / Subchronic	4.00E-03	mg/kg	4.00E-03	mg/kg	Nonneoplastic Lesions of Splenic Capsule	3000 / 1	IRIS	3/08
Arsenic	Chronic / Subchronic	3.00E-04	mg/kg	3.00E-04	mg/kg	Hyperpigmentation, Kertosis and Possible Vascular Complications	3 / 1	IRIS	3/08
Benzene	Chronic	4.00E-03	mg/kg	4.00E-03	mg/kg	Decreased Lymphocyte Count	300 / 1	IRIS	3/08
Benzene	Subchronic	1.20E-02	mg/kg	1.20E-02	mg/kg	Decreased Lymphocyte Count	100 / 1 (1)	IRIS	3/08
Benzo(a)pyrene	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	Chronic / Subchronic (chr)	5.00E-04 (c)	mg/kg	2.50E-05	mg/kg	Significant Proteinuria	10 / 1	IRIS	3/08
Cadmium	Chronic / Subchronic (chr)	1.00E-03 (d)	mg/kg	2.50E-05	mg/kg	Significant Proteinuria	10 / 1	IRIS	3/08
Chlorobenzene	Chronic	2.00E-02	mg/kg	2.00E-02	mg/kg	Histopathologic Changes in Liver	1000 / 1	IRIS	3/08
Chlorobenzene	Subchronic	2.00E-01	mg/kg	2.00E-01	mg/kg	Histopathologic Changes in Liver	100 / 1 (2)	IRIS	3/08
Chloroform	Chronic / Subchronic (chr)	1.00E-02	mg/kg	1.00E-02	mg/kg	Moderate/Marked Fatty Cyst Formation in the Liver and Elevated SGPT	100 / 1	IRIS	3/08
Chloromethane	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	Chronic	5.00E-05	mg/kg	5.00E-05	mg/kg	Liver Lesions	100 / 1	IRIS	3/08
Dieldrin	Subchronic	1.00E-04	mg/kg	1.00E-04	mg/kg	Neurological	100	ATSDR	11/07
Dioxin TEQ-HH	Chronic	1.00E-09	mg/kg	1.00E-09	mg/kg	Developmental	90	ATSDR	11/07
Dioxin TEQ-HH	Subchronic	2.00E-08	mg/kg	2.00E-08	mg/kg	Lymphatic Effects	30	ATSDR	11/07
Lead	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic / Subchronic	2.40E-02 (e)	mg/kg	9.60E-04	mg/kg	CNS Effects (Other Effect: Impairment of Neurobehavioral Function)	1 / 3	IRIS	3/08
MCPA	Chronic / Subchronic	5.00E-04	mg/kg	5.00E-04	mg/kg	Kidney and Liver Toxicity	300 / 1	IRIS	3/08
Naphthalene	Chronic	2.00E-02	mg/kg	2.00E-02	mg/kg	Decreased mean terminal body weight in males	3000 / 1	IRIS	3/08
Naphthalene	Subchronic	2.00E-01	mg/kg	2.00E-01	mg/kg	Decreased mean terminal body weight in males	300 / 1 (2)	IRIS	3/08
PCBs, Total	Chronic	2.00E-05 (f)	mg/kg	2.00E-05	mg/kg	Ocular, Meibomiam gland, Finger and Toenail, Immune Effects	300 / 1	IRIS	3/08
PCBs, Total	Subchronic	6.00E-05(f)	mg/kg	6.00E-05	mg/kg	Ocular, Meibomiam gland, Finger and Toenail, Immune Effects	100 / 1 (1)	IRIS	3/08

Pentachlorophenol	Chronic / Subchronic	3.00E-02	mg/kg	3.00E-02	mg/kg	Liver and Kidney Pathology	100 / 1	IRIS	3/08
Tetrachloroethene	Chronic	1.00E-02	mg/kg	1.00E-02	mg/kg	Hepatotoxicity in Mice, Weight Gain in Rats	1000 / 1	IRIS	3/08
Tetrachloroethene	Subchronic	1.00E-01	mg/kg	1.00E-01	mg/kg	Hepatotoxicity in Mice, Weight Gain in Rats	100 / 1 (2)	IRIS	3/08
Toluene	Chronic	8.00E-02	mg/kg	8.00E-02	mg/kg	Increased Kidney Weight	3000 / 1	IRIS	3/08
Toluene	Subchronic	8.00E-01	mg/kg	8.00E-01	mg/kg	Increased Kidney Weight	300 / 1 (2)	IRIS	3/08
Trichloroethene	Chronic / Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	Chronic	2.00E-01	mg/kg	2.00E-01	mg/kg	Decreased body weight and increased mortality	1000 / 1	IRIS	3/08
Xylenes, Total	Subchronic	4.00E-01	mg/kg	4.00E-01	mg/kg	Neurological	1000	ATSDR	11/07
Pathway: Inhalation									
Contaminant of Concern	**Chronic**	**Inhalation RfC value**	**Inhalation RfC Units**	**Inhalation RfD Value(g)**	**Inhalation RfD Units**	**Primary Target Organ**	**Combined UF/MF**	**Sources of RfC Target Organ**	**Date**
1,2,4-Trichlorobenzene	Chronic	4.00E-03	mg/m^3	1.14E-03	mg/kg	Increased urinary porphyria	1000	PPRTV	10/16/02
1,2,4-Trichlorobenzene	Subchronic	4.00E-02	mg/m^3	1.14E-02	mg/kg	Increased urinary porphyria	100 (2)	PPRTV	10/16/02
1,2-Dichloroethane	Chronic / Subchronic (chr)	2.45E+00 (h)	mg/m^3	7.00E-01	mg/kg	Liver	90	ATSDR	11/07
			mg/m^3		mg/kg				
1,2-Dichloroethene (total)	Chronic	6.00E-02 (i)	mg/m^3	1.71E-02	mg/kg	Liver and Lung	3000 / 1	PPRTV	3/1/06
1,2-Dichloroethene (total)	Subchronic	8.00E-01(j)	mg/m^3	2.29E-01	mg/kg	Liver	1000	ATSDR	11/07
1,4-Dichlorobenzene	Chronic	8.00E-01	mg/m^3	2.29E-01	mg/kg	Increased liver weight	100 / 1	IRIS	3/08
1,4-Dichlorobenzene	Subchronic	1.20E+00	mg/m^3	3.43E-01	mg/kg	Liver effects	100	ATSDR	11/07
2-Methylnaphthalene	Chronic	3.00E-03 (k)	mg/m^3	8.57E-04	mg/kg	Nasal Effects; Hyperplasia and Metaplasia in respiratory and olfactory epithelium	3000 / 1	IRIS	3/08
2-Methylnaphthalene	Subchronic	9.00E-03 (k)	mg/m^3	2.57E-03	mg/kg	Nasal Effects; Hyperplasia and Metaplasia in respiratory and olfactory epithelium	1000 / 1 (1)	IRIS	3/08
Benzene	Chronic	3.00E-02	mg/m^3	8.57E-03	mg/kg	Decreased Lymphocyte Count	300 / 1	IRIS	3/08
Benzene	Subchronic	9.00E-02	mg/m^3	2.57E-02	mg/kg	Decreased Lymphocyte Count	100 / 1 (1)	IRIS	3/08
Cadmium	Chronic / Subchronic (chr)	2.00E-05	mg/m^3	5.71E-06	mg/kg	Kidney; Respiratory System	NA	CalEPA	2/05
Chlorobenzene	Chronic	5.00E-02	mg/m^3	1.43E-02	mg/kg	Liver and Kidney effects	1000 / 1	PPRTV	10/12/06
Chlorobenzene	Subchronic	5.00E-01	mg/m^3	1.43E-01	mg/kg	Liver and Kidney effects	100 / 1	PPRTV	10/12/06
Chloroform	Chronic / Subchronic (chr)	3.00E-01	mg/m^3	8.57E-02	mg/kg	Gastrointestinal system, kidney, development	NA	CalEPA	2/05
Chloromethane	Chronic	9.00E-02	mg/m^3	2.57E-02	mg/kg	Cerebellar lesions	1000 / 1	IRIS	3/08
Chloromethane	Subchronic	9.00E-01	mg/m^3	2.57E-01	mg/kg	Cerebellar lesions	100 / 1 (2)	IRIS	3/08
Naphthalene	Chronic	3.00E-03	mg/m^3	8.57E-04	mg/kg	Nasal Effects; Hyperplasia and Metaplasia in respiratory and olfactory epithelium	3000 / 1	IRIS	3/08
Naphthalene	Subchronic	9.00E-03	mg/m^3	2.57E-03	mg/kg	Nasal Effects; Hyperplasia and Metaplasia in respiratory and olfactory epithelium	1000 / 1 (1)	IRIS	3/08
Tetrachloroethene	Chronic / Subchronic (chr)	3.50E-02	mg/m^3	1.00E-02	mg/kg	Kidney, liver	NA	CalEPA	2/05
Toluene	Chronic / Subchronic (chr)	5.00E+00	mg/m^3	1.43E+00	mg/kg	Neurological effects in occupationally exposed workers.	10 / 1	IRIS	3/08
Trichloroethene	Chronic / Subchronic (chr)	6.00E-01	mg/m^3	1.71E-01	mg/kg	Nervous system, eyes	100 / 1	CalEPA	2/05
Xylenes, Total	Chronic	1.00E-01	mg/m^3	2.86E-02	mg/kg	Impaired motor coordination	300 / 1	IRIS	3/08
Xylenes, Total	Subchronic	3.00E-01	mg/m^3	8.57E-02	mg/kg	Impaired motor coordination	100 / 1 (1)	IRIS	3/08

Notes - Chronic values used where sub-chronic values are not available, denoted with "chr".

a. Value for trans-1,2-Dichloroethane. No value on IRIS for total or cis-1,2-Dichloroethane.
b. Retired value.
c. Reference dose for water used to evaluate potential groundwater and surface water exposures.

PCB: Polychlorinated Biphenyls
2,3,7,8-TCDD TEQ: 2,3,7,8 Tetrachlorodibenzo-p-dioxin toxic equivalent Concentration for Human Health
NA: Value not available/not calculated
UF/MF: Uncertainty factor/modifying factor
IRIS: Integrated Risk Information System
CalEPA – California Environmental Protection Agency

d. Reference dose for food used to evaluate potential soil exposures. e. When assessing exposure to manganese in soil or drinking water, IRIS (03/08) recommends applying a modifying factor of 3 to the oral RfD of 0.14 mg/kg-day. The USEPA Region 9 PRG table (USEPA, 2004) also indicates that the average dietary manganese content of the US diet (5 mg/day) be subtracted from the critical dose of 10 mg/day. Therefore, the RfD is (10 mg/day - 5 mg/day)/Modifying Factor (3) = 1.67 mg/day / 70 kg = 0.024 mg/kg-day. f. Value for Aroclor 1254. g. Converted from reference concentration: RfC (mg/m^3) x (20 m^3 air/day)/70 kg body weight. h. MRL for 1,2-Dichloroethane converted to RfC as follows: MRL (0.6 ppm) x Molecular Weight (98.96 g/mol)/ Molar Volume of Air in liters (24.45) i. Value for 1,2-dichloroethene (trans). Retired value. j. Value for 1,2-dichloroethene (trans). MRL converted to RfC as follows: MRL (ppm) x Molecular Weight (g/mol)/ Molar Volume of Air in liters (24.45). Intermediate MRL. k. Value for Naphthalene used as surrogate based on structural similarities.	ATSDR – Agency for Toxic Substances and Disease Registry PPRTV – Provisional Peer Reviewed Toxicity Value RfC – Reference Concentration RfD – Reference dose Modifications to adjustment factors to account for subchronic: 1 - Uncertainty factor of 3 for sub-chronic to chronic exposure removed to derive subchronic reference dose. 2 - Uncertainty factor of 10 for sub-chronic to chronic exposure removed to derive subchronic reference dose.

Table 3
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site O

Scenario Timeframe: Current / Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site O	PCBs, Total	Eyes, Nails, Immune	1.16	NA	0.589	1.75
	Excavation Air	Site O	Benzene	Immune	NA	0.908	NA	0.908
			Xylenes, Total	Nervous System	NA	4.64	NA	4.64
							Soil / Waste Hazard Index =	7.3
							Hazard Index Total =	7.3
							Eyes Hazard Index =	1.75
							Nails Hazard Index =	1.75
							Immune Hazard Index =	2.66
							Nervous System Hazard Index =	4.64

NA – Not applicable

No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

Table 4
Risk Characterization Summary for Construction Workers – Carcinogens
Site O North

Scenario Timeframe: Current / Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site O North	PCBs, Total	NCOC	NA	NCOC	NCOC
			Dioxin TEQ-HH	3.36E-4	NA	6.05E-5	3.97E-4
	Excavation Air	Site O North	Xylenes, Total	NA	NC	NA	NC
						Soil / Waste Risk Total	3.97E-4
Leachate	Leachate	O-Leach-0-1	PCBS, Total	NCOC	NA	NCOC	NCOC
						Leachate Risk Total	NA
						Risk total =	3.97E-4

NA – Not applicable.

NCOC – Not identified as a COC.

NC – Not calculated; non-carcinogen

Table 5
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site O North

Scenario Timeframe: Current / Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site O North	PCBs, Total	Eyes, Nails, Immune	21.8	NA	11	32.8
			Dioxin TEQ-HH	Immune	7.85	NA	1.41	9.26
	Excavation Air	Site O North	Xylenes, Total	Nervous System	NA	2.25	NA	2.25
							Soil / Waste Hazard Index	44.3
Leachate	Leachate	O-Leach-0-1	PCBs, Total	Eyes, Nails, Immune	0.00179	NA	2.37	2.37
							Leachate Hazard Index	2.37
							Hazard Index Total =	46.7
							Eyes Hazard Index =	35.2
							Immune Hazard Index =	44.5
							Nails Hazard Index =	35.2
							Nervous System Hazard Index =	2.25

NA – Not applicable

Table 6
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site P

Scenario Timeframe: Current / Future

Receptor Population: Construction Worker

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site P	PCBs, Total	Eyes, Nails, Immune	0.873	NA	0.442	1.32
	Excavation Air	Site P	Tetrachloroethene	Kidney Liver	NA	1.11	NA	1.11
							Soil / Waste Hazard Index =	2.42
							Hazard Index Total =	2.42
							Eyes Hazard Index =	1.32
							Immune Hazard Index =	1.32
							Kidney Hazard Index =	1.11
							Liver Hazard Index =	1.11
							Nails Hazard Index =	1.32

NA – Not applicable

No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

Table 7
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site Q North

Scenario Timeframe: Current / Future

Receptor Population: Construction Worker

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site Q North	PCBs, Total	Eyes, Nails, Immune	1.06	NA	0.538	1.6
			Dioxin TEQ-HH	Immune	0.593	NA	0.107	0.7
							Soil / Waste Hazard Index	2.3
Leachate	Leachate	Q North – Leach – Q 1	2,4-Dichlorophenol	Nervous System	0.117	NA	4.13	4.24
			Pentachlorophenol	Kidney, Liver	0.000411	NA	0.484	0.484
			PCBs, Total	Eyes, Nails, Immune	0.00156	NA	2.07	2.07
							Leachate Hazard Index	6.8
							Hazard Index Total =	9.1
							Eyes Hazard Index =	3.67
							Immune Hazard Index =	4.37
							Nails Hazard Index =	3.67
							Nervous System Hazard Index =	4.24

NA – Not applicable

No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

Table 8
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site Q South

Scenario Timeframe: Current / Future

Receptor Population: Construction Worker

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site Q South	Cadmium	Kidney	1.27	NA	0.153	1.42
	Excavation Air	Site Q South	Cadmium	Kidney, Respiratory	NA	1.2	NA	1.2
							Soil / Waste Hazard Index =	2.63
							Hazard Index Total =	2.63
							Kidney Hazard Index =	2.63
							Respiratory Hazard Index =	1.20

NA – Not applicable

No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

Table 9
Risk Characterization Summary for Construction Workers – Carcinogens
Site R

Scenario Timeframe: Current / Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site R	PCBs, Total	NCOC	NA	NCOC	NCOC
	Excavation Air	Site R	Benzene	NA	NCOC	NA	NCOC
			Chlorobenzene	NA	NC	NA	NC
			Tetrachloroethene	NA	5.08E-05	NA	5.08E-05
			Trichloroethene	NA	2.38E-05	NA	2.38E-05
						Soil / Waste Risk Total	7.46E-5
Leachate	Leachate	R-Leach-R-1	1,2-Dichloroethane	5.00E-06	NA	2.44E-05	2.94E-05
			Benzene	NCOC	NA	NCOC	NCOC
			Chloroform	NC	NA	NC	NC
			Tetrachloroethene	1.04E-03	NA	6.02E-02	6.12E-02
			Toluene	NC	NA	NC	NC
			Trichloroethene	2.90E-05	NA	4.69E-04	4.98E-04
			2,4-Dichlorophenol	NC	NA	NC	NC
			2-Methylnaphthalene	NC	NA	NC	NC
			4-Chloroaniline	NCOC	NA	NCOC	NCOC
			Benzo(a)pyrene	3.67E-08	NA	7.71E-05	7.71E-05
			Benzo(b)fluoranthene	2.90E-07	NA	6.19E-04	6.20E-04
			Benzo(k)fluoranthene	2.87E-08	NA	5.70E-05	5.71E-05
			Dibenzo(a,h)anthracene	3.88E-08	NA	1.26E-04	1.26E-04
			4,4'-DDT	NCOC	NA	NCOC	NCOC
			MCPA	NC	NA	NC	NC
			PCBs, Total	9.77E-06	NA	1.29E-02	1.29E-02
			Dioxin TEQ-HH	1.18E-08	NA	2.27E-05	2.27E-05
			Manganese	NC	NA	NC	NC
	Trench Air	R-Leach-R-1	1,2-Dichloroethane	NA	1.11E-03	NA	1.11E-03
			1,2-Dichloroethene (total)	NA	NC	NA	NC
			Benzene	NA	1.57E-04	NA	1.57E-04
			Chlorobenzene	NA	NC	NA	NC
			Chloroform	NA	1.56E-04	NA	1.56E-04
			Tetrachloroethene	NA	7.48E-03	NA	7.48E-03
			Toluene	NA	NC	NA	NC
			Trichloroethene	NA	3.21E-03	NA	3.21E-03
			Xylenes, Total	NA	NC	NA	NC
			1,2,4-Trichlorobenzene	NA	NC	NA	NC
			2-Methylnaphthalene	NA	NC	NA	NC
			Naphthalene	NA	NC	NA	NC
						Leachate Risk Total	1.21E-2
						Risk total =	8.78E-2

NA – Not applicable.
NCOC – Not identified as a COC.
NC – Not calculated; non-carcinogen.

Table 10
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site R

Scenario Timeframe: Current / Future

Receptor Population: Construction Worker

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site R	PCBs, Total	Eye, Nails, Immune	0.681	NA	0.345	1.03
	Excavation Air	Site R	Benzene	Immune	NA	0.543	NA	0.543
			Chlorobenzene	Kidney, Liver	NA	0.504	NA	0.504
			Tetrachloroethene	Kidney, Liver	NA	16.9	NA	16.9
			Trichloroethene	Nervous system, Eye	NA	1.39	NA	1.39
							Soil / Waste Hazard Index	20.4
Leachate	Leachate	R-Leach-R-1	1,2-Dichloroethane	Kidney	NCOC	NA	NCOC	NCOC
			Benzene	Immune	0.239	NA	3.67	3.91
			Chloroform	Liver, Hematological	0.06	NA	0.527	0.587
			Tetrachloroethene	Liver, Body weight	1.34	NA	78	79.4
			Toluene	Kidney	0.0424	NA	1.46	1.50
			Trichloroethene	--	NC	NA	NC	NC
			2,4-Dichlorophenol	Nervous System	0.0159	NA	0.558	0.574
			2-Methylnaphthalene	Respiratory	0.00794	NA	1.05	1.06
			4-Chloroaniline	Spleen	0.264	NA	1.75	2.02
			Benzo(a)pyrene	--	NC	NA	NC	NC
			Benzo(b)fluoranthene	--	NC	NA	NC	NC
			Benzo(k)fluoranthene	--	NC	NA	NC	NC
			Dibenzo(a,h)anthracene	--	NC	NA	NC	NC
			4,4'-DDT	Liver	0.00321	NA	3.56	3.56
			MCPA	Kidney, Liver	4.28	NA	154	158
			PCBs, Total	Eye, Nails, Immune	5.70	NA	7540	7540
			Dioxin TEQ-HH	Immune	0.000275	NA	0.529	0.529
			Manganese	Nervous System	0.0204	NA	0.336	0.357
	Trench Air	R-Leach-R-1	1,2-Dichloroethane	Liver	NA	1.22	NA	1.22
			1,2-Dichloroethene (total)	Liver	NA	2.75	NA	2.75
			Benzene	Immune	NA	24.7	NA	24.7
			Chlorobenzene	Kidney, Liver	NA	2.77	NA	2.77
			Chloroform	Gastrointestinal, Kidney, Developmental	NA	1.58	NA	1.58
			Tetrachloroethene	Kidney, Liver	NA	2490	NA	2490
			Toluene	Nervous system	NA	4.62	NA	4.62
			Trichloroethene	Nervous system, Eye	NA	187	NA	187
			Xylenes, Total	Nervous system	NA	5.14	NA	5.14
			1,2,4-Trichlorobenzene	Kidney	NA	0.864	NA	0.864
			2-Methylnaphthalene	Nasal	NA	2.11	NA	2.11
			Naphthalene	Nasal	NA	0.696	NA	0.696
							Leachate Hazard Index =	2730
							Hazard Index Total =	10500
							Body weight Hazard Index =	79.4
							Developmental Hazard Index =	1.58
							Eye Hazard Index =	7730
							Gastrointestinal Hazard Index =	1.58
							Hematological Hazard Index =	0.587
							Immune Hazard Index =	7570
							Kidney Hazard Index =	2680
							Liver Hazard Index =	2760
							Nails Hazard Index =	7540
							Nasal Hazard Index =	2.80
							Nervous System Hazard Index =	199
							Respiratory Hazard Index =	1.06
							Spleen Hazard Index =	2.02

NA – Not applicable NCOC – Not identified as a COC.

NC – Not calculated; carcinogen.

Table 11
Risk Characterization Summary for Construction Worker – Non-Carcinogens
Site S

Scenario Timeframe: Current / Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Soil / Waste	Site S	PCBs, Total	Eye, Nails, Immune	7.21	NA	3.65	10.9
	Excavation Air	Site S	Xylenes, Total	Nervous System	NA	1.87	NA	1.87
							Soil / Waste Hazard Index =	12.7
							Hazard Index Total =	12.7
							Eye Hazard Index =	10.9
							Immune Hazard Index =	10.9
							Nails Hazard Index =	10.9
							Nervous System Hazard Index =	1.87

NA – Not applicable
No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

Table 12
Risk Characterization Summary for Outdoor Industrial Workers – Carcinogens
Site O

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site O	Dioxin TEQ-HH	1.35E-4	NA	5.34E-5	1.88E-4
	Ambient Air	Site O	Benzene	NA	6.65E-5	NA	6.65E-5
			Xylenes, Total	NA	NC	NA	NC
						Soil / Waste Risk Total	2.55E-4
Groundwater	Ambient Air	O-AA-Clay-2-22	Benzene	NA	9.95E-5	NA	9.95E-5
						Groundwater Risk Total	9.95E-5
						Risk total =	3.54E-4

NA – Not applicable.
NC – Not calculated; non-carcinogen

Table13
Risk Characterization Summary for Outdoor Industrial Workers – Non-Carcinogens
Site O

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site O	Dioxin TEQ-HH	Developmental	2.52	NA	0.997	3.51
	Ambient Air	Site O	Benzene	Immune	NA	1.25	NA	1.25
			Xylenes, Total	Nervous System	NA	6.41	NA	6.41
							Soil / Waste Hazard Index	11.2
Groundwater	Ambient Air	O-AA-Clay-2-22	Benzene	Immune	NA	1.87	NA	1.87
							Groundwater Hazard Index	1.87
							Hazard Index Total	13
							Developmental Hazard Index =	3.51
							Immune Hazard Index =	3.13
							Nervous Hazard Index =	6.41

NA – Not applicable

Table 14
Risk Characterization Summary for Outdoor Industrial Workers – Carcinogens
Site O North

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site O North	PCBs, Total	3.13E-4	NA	3.48E-4	6.61E-4
			Dioxin TEQ-HH	1.03E-3	NA	4.06E-4	1.43E-3
	Excavation Air	Site O North	Xylenes, Total	NA	NC	NA	NC
			1,2,4-Trichlorobenzene	NA	NCOC	NA	NCOC
						Soil / Waste Risk Total	2.09E-3
						Risk total =	2.09E-3

NA – Not applicable.
NCOC – Not identified as a COC.
NC – Not calculated; non-carcinogen.

Table 15
Risk Characterization Summary for Outdoor Industrial Workers – Non-Carcinogens
Site O North

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site O North	PCBs, Total	Eyes, Nails, Immune	21.9	NA	24.4	46.3
			Dioxin TEQ-HH	Developmental	19.1	NA	7.58	26.7
	Ambient Air	Site O North	Xylenes, Total	Nervous System	NA	3.16	NA	3.16
			1,2,4-Trichlorobenzene	Kidney	NA	1.40	NA	1.40
							Soil / Waste Hazard Index =	77.5
							Hazard Index Total =	77.5
							Developmental Hazard Index =	26.7
							Eyes Hazard Index =	46.3
							Immune Hazard Index =	46.3
							Kidney Hazard Index =	1.4
							Nails Hazard Index =	46.3
							Nervous System Hazard Index =	3.16

NA – Not applicable

Table 16
Risk Characterization Summary for Outdoor Industrial Workers – Non-Carcinogens
Site Q Central

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site Q Central	Dioxin TEQ-HH	Developmental	0.777	NA	0.308	1.08
							Soil / Waste Hazard Index =	1.08
							Hazard Index Total =	1.08
							Developmental Hazard Index =	1.08

NA – Not applicable
No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

Table 17
Risk Characterization Summary for Outdoor Industrial Workers – Non-Carcinogens
Site Q South

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site Q South	Dioxin TEQ-HH	Developmental	1.38	NA	0.545	1.92
			Cadmium	Kidney	2.72	NA	0.717	3.43
							Soil / Waste Hazard Index =	5.35
							Hazard Index Total =	5.35
							Kidney Hazard Index =	3.43
							Developmental Hazard Index =	1.92

NA – Not applicable

Table 18
Risk Characterization Summary for Outdoor Industrial Workers – Carcinogens
Site Q South

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site Q South	Dioxin TEQ-HH	7.37E-5	NA	2.92E-5	1.03E-4
			Cadmium	NC	NA	NC	NC
						Soil / Waste Risk Total	1.03E-4
						Risk total =	1.03E-4

NA – Not applicable.

NC – Not calculated; non-carcinogen

Table 19
Risk Characterization Summary for Outdoor Industrial Worker – Carcinogens
Site R

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Ambient Air	Site R	1,2-Dichloroethane	NA	5.46E-05	NA	5.46E-05
			Chlorobenzene	NA	NC	NA	NC
			Tetrachloroethene	NA	5.84E-04	NA	5.84E-04
			Trichloroethene	NA	2.73E-04	NA	2.73E-04
			1,2,4-Trichlorobenzene	NA	NC	NA	NC
						Soil / Waste Risk Total	9.11E-4
Leachate	Ambient Air	R-Leach-R-1	1,2-Dichloroethane	NA	3.99E-03	NA	3.99E-03
			1,2-Dichloroethene (total)	NA	NC	NA	NC
			Benzene	NA	2.24E-03	NA	2.24E-03
			Chlorobenzene	NA	NC	NA	NC
			Chloroform	NA	1.70E-03	NA	1.70E-03
			Chloromethane	NA	NC	NA	NC
			Tetrachloroethene	NA	3.31E-01	NA	3.31E-01
			Toluene	NA	NC	NA	NC
			Trichloroethene	NA	7.82E-02	NA	7.82E-02
			Xylenes, Total	NA	NC	NA	NC
			1,4-Dichlorobenzene	NA	4.53E-05	NA	4.53E-05
						Leachate Risk Total	4.17E-1
						Risk total =	4.18E-1

NA – Not applicable.

NC – Not calculated; non-carcinogen.

Table 20
Risk Characterization Summary for Outdoor Industrial Worker – Non-Carcinogens
Site R

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Ambient Air	Site R	1,2-Dichloroethane	Liver	NA	NCOC	NA	NCOC
			Chlorobenzene	Kidney, Liver	NA	2.31	NA	2.31
			Tetrachloroethene	Kidney, Liver	NA	7.78	NA	7.78
			Trichloroethene	Nervous system, Eye	NA	NCOC	NA	NCOC
			1,2,4-Trichlorobenzene	Kidney	NA	0.846	NA	0.846
							Soil / Waste Hazard Index	10.9
Leachate	Ambient Air	R-Leach-R-I	1,2-Dichloroethane	Liver	NA	NCOC	NA	NCOC
			1,2-Dichloroethene (total)	Liver, Respiratory	NA	10.2	NA	10.2
			Benzene	Immune	NA	42.2	NA	42.2
			Chlorobenzene	Kidney, Liver	NA	8.30	NA	8.30
			Chloroform	Gastrointestinal, Kidney, Developmental	NA	0.689	NA	0.689
			Chloromethane	Brain	NA	3.30	NA	3.30
			Tetrachloroethene	Kidney, Liver	NA	4410	NA	4410
			Toluene	Nervous system	NA	3.53	NA	3.53
			Trichloroethene	Nervous system, Eye	NA	182	NA	182
			Xylenes, Total	Nervous system	NA	8.92	NA	8.92
			1,4-Dichlorobenzene	Liver	NA	NCOC	NA	NCOC
							Leachate Hazard Index =	4670
							Hazard Index Total =	4680
							Brain Hazard Index =	3.30
							Developmental Hazard Index =	0.689
							Eye Hazard Index =	182
							Gastrointestinal Hazard Index =	0.689
							Immune Hazard Index =	42.2
							Kidney Hazard Index =	4430
							Liver Hazard Index =	4440
							Nervous system Hazard Index =	195
							Respiratory Hazard Index =	10.2

NA – Not applicable
NCOC – Not identified as a COC.

Table 21
Risk Characterization Summary for Outdoor Industrial Workers – Carcinogens
Site S

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site S	PCBs, Total	4.45E-4	NA	4.95E-4	9.40E-4
	Ambient Air	Site S	Chlorobenzene	NA	NC	NA	NC
			Xylenes, Total	NA	NC	NA	NC
			1,4-Dichlorobenzene	NA	3.2E-5	NA	3.2E-5
						Soil / Waste Risk Total	9.72E-4
						Risk total =	9.72E-4

NA – Not applicable.
NC – Not calculated; non-carcinogen.

Table 22
Risk Characterization Summary for Outdoor Industrial Workers – Non-Carcinogens
Site S

Scenario Timeframe: Current / Future
Receptor Population: Outdoor Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site S	PCBs, Total	Eyes, Nails, Immune	31.1	NA	34.6	65.8
	Ambient Air	Site S	Chlorobenzene	Kidney, Liver	NA	1.39	NA	1.39
			Xylenes, Total	Nervous system	NA	2.66	NA	2.66
			1,4-Dichlorobenzene	Liver	NA	NCOC	NA	NCOC
							Soil / Waste Hazard Index =	69.8
							Hazard Index Total =	69.8
							Eyes Hazard Index =	65.8
							Immune Hazard Index =	65.8
							Kidney Hazard Index =	1.39
							Liver Hazard Index =	1.39
							Nails Hazard Index =	65.8
							Nervous system Hazard Index =	2.66

NA – Not applicable
NCOC – Not identified as a COC.

Table 23
Risk Characterization Summary for Recreational Fisher – Carcinogens
Site Q South (Large Pond)

Scenario Timeframe: Current / Future
Receptor Population: Recreational Fisher
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Tissue	Fish Tissue	Site Q South Large Pond Black Bullhead Fillet	Dieldrin	7.84E-5	NA	NA	7.84E-5
			PCBs, Total	3.79E-4	NA	NA	3.79E-4
						Fish Tissue Risk Total	4.57E-4
						Risk total =	4.57E-4

NA – Not applicable.

Table 24
Risk Characterization Summary for Recreational Fisher – Non-Carcinogens
Site Q South (Large Pond)

Scenario Timeframe: Current / Future
Receptor Population: Recreational Fisher
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Tissue	Fish Tissue	Site Q South Large Pond Black Bullhead Fillet	Dieldrin	Liver	NCOC	NA	NA	NCOC
			PCBs, Total	Eyes, Nails, Immune	22.1	NA	NA	22.1
							Fish Tissue Hazard Index =	22.1
							Hazard Index Total =	22.1
							Eyes Hazard Index =	22.1
							Immune Hazard Index =	22.1
							Nails Hazard Index =	22.1

NA – Not applicable
NCOC – Not identified as a COC.

Table 25
Risk Characterization Summary for Recreational Fisher – Carcinogens
Site Q South (Large Pond)

Scenario Timeframe: Current / Future
Receptor Population: Recreational Fisher
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Tissue	Fish Tissue	Site Q South - Large Pond - Carp	Benzo(a)pyrene	6.44E-5	NA	NA	6.44E-5
			Dieldrin	1.49E-4	NA	NA	1.49E-4
			PCBs, Total	9.82E-4	NA	NA	9.82E-4
			Dioxin TEQ-HH	1.12E-4	NA	NA	1.12E-4
			Arsenic	6.02E-5	NA	NA	6.02E-5
						Fish Tissue Risk Total	1.37E-3
						Risk total =	1.37E-3

NA – Not applicable.

Table 26
Risk Characterization Summary for Recreational Fisher – Non-Carcinogens
Site Q South (Large Pond)

Scenario Timeframe: Current / Future
Receptor Population: Recreational Fisher
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Tissue	Fish Tissue	Site Q South - Large Pond - Carp	Benzo(a)pyrene	--	NC	NA	NA	NC
			Dieldrin	Liver	NCOC	NA	NA	NCOC
			PCBs, Total	Eye, Nails, Immune	57.3	NA	NA	57.3
			Dioxin TEQ-HH	Developmental	1.75	NA	NA	1.75
			Arsenic	Skin, Vascular	NCOC	NA	NA	NCOC
							Fish Tissue Hazard Index =	59.0
							Hazard Index Total =	59.0
							Developmental Hazard Index =	1.75
							Eye Hazard Index =	57.3
							Immune Hazard Index =	57.3
							Nails Hazard Index =	57.3

NA – Not applicable
NCOC – Not identified as a COC.
NC – Not calculated; carcinogen.

Table 27
Risk Characterization Summary for Recreational Fisher – Carcinogens
Site Q South (Small Pond)

Scenario Timeframe: Current / Future
Receptor Population: Recreational Fisher
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Q South Small Pond	Benzo(a)pyrene	1.24E-7	NA	2.72E-4	2.72E-4
						Surface Water Risk Total	2.72E-4
						Risk total =	2.72E-4

NA – Not applicable.
No contaminants were identified as COCs on the basis of their non-carcinogenic risk contribution.

Table 28
Risk Characterization Summary for Trespassing Teenager – Non-Carcinogens
Site O North

Scenario Timeframe: Current / Future
Receptor Population: Trespassing Teenager
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site O North	PCBs, Total	Eye, Nails, Immune	4.46	NA	1.02	5.48
			Dioxin TEQ-HH	Developmental	3.90	NA	0.316	4.22
							Soil / Waste Hazard Index =	9.70
							Hazard Index Total =	9.70
							Developmental Hazard Index =	4.22
							Eye Hazard Index =	5.48
							Immune Hazard Index =	5.48
							Nails Hazard Index =	5.48

NA – Not applicable

Table 29
Risk Characterization Summary for Trespassing Teenager – Carcinogens
Site O North

Scenario Timeframe: Current / Future
Receptor Population: Trespassing Teenager
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site O North	PCBs, Total	NCOC	NA	NCOC	NCOC
			Dioxin TEQ-HH	1.92E-7	NA	9.92E-5	9.94E-5
						Soil / Waste Risk Total	9.94E-5
						Risk total =	9.94E-5

NA – Not applicable.

NCOC – Not identified as a COC.

Table 30
Risk Characterization Summary for Trespassing Teenager – Carcinogens
Site Q South (Small Pond)

Scenario Timeframe: Current / Future
Receptor Population: Trespassing Teenager
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site Q South - Small Pond	Benzo(a)pyrene	6.00E-8	NA	2.10E-4	2.10E-4
						Surface Water Risk Total	2.10E-4
						Risk total =	2.10E-4

NA – Not applicable.

No contaminants were identified as COCs on the basis of their non-carcinogenic risk contribution.

Table 31
Risk Characterization Summary for Trespassing Teenager – Carcinogens
Site R

Scenario Timeframe: Current / Future
Receptor Population: Trespassing Teenager
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Leachate	Ambient Air	R-Leach-R1	1,2-Dichloroethane	NA	6.70E-5	NA	6.70E-5
			Benzene	NA	NCOC	NA	NCOC
			Tetrachloroethene	NA	5.56E-3	NA	5.56E-3
			Trichloroethene	NA	1.31E-3	NA	1.31E-3
						Leachate Risk Total	6.94E-3
						Risk total =	6.94E-3

NA – Not applicable.

NCOC – Not identified as a COC.

Table 32
Risk Characterization Summary for Trespassing Teenager – Non-Carcinogens
Site R

Scenario Timeframe: Current / Future

Receptor Population: Trespassing Teenager

Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Leachate	Ambient Air	R-Leach-R1	1,2-Dichloroethane	Liver	NA	NCOC	NA	NCOC
			Benzene	Immune	NA	1.61	NA	1.61
			Tetrachloroethene	Kidney, Liver	NA	169	NA	169
			Trichloroethene	Nervous system, Eye	NA	6.97	NA	6.97
							Hazard Index Total =	178
							Eye Hazard Index =	6.97
							Nervous system Hazard Index =	6.97
							Immune Hazard Index =	1.61
							Kidney Hazard Index =	169
							Liver Hazard Index =	169

NA – Not applicable

NCOC – Not identified as a COC.

Table 33
Risk Characterization Summary for Trespassing Teenager – Non-Carcinogens
Site S

Scenario Timeframe: Current / Future

Receptor Population: Trespassing Teenager

Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk (Hazard Index)			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil / Waste	Surface Soil	Site S	PCBs, Total	Eye, Nails, Immune	6.34	NA	1.44	7.79
							Soil / Waste Hazard Index =	7.79
							Hazard Index Total =	7.79
							Eye Hazard Index =	7.79
							Nails Hazard Index =	7.79
							Immune Hazard Index =	7.79

NA – Not applicable

No contaminants were identified as COCs on the basis of their carcinogenic risk contribution.

APPENDIX E

REMEDIAL GOAL FOR SURFACE SOILS

Remedial Goals for Surface Soil

Sauget Area 2, St. Clair County, Illinois

Receptor and Site	EPC (mg/kg)	Cancer Calculated Risk	Noncancer Calculated Risk	Remedial Goals Based on Cancer Risk Level			Remedial Goals Based on Hazard Quotient Level			Final Remedial Goal	
				mg/kg			mg/kg			Value (mg/kg)	Basis
				1E-06	1E-05	1E-04	0.1	1	3		
Outdoor Industrial Workers - Site O											
Dioxin TEQ-HH	6.77E-03	2E-04	4	3.6E-05	3.6E-04	3.6E-03	1.9E-04	1.9E-03	5.8E-03	1.9E-03	HQ = 1 and ELCR < $1x10^{-4}$
Outdoor Industrial Workers - Site O North											
PCBs, Total	709	7E-04	46	1	11	107	2	15	46	15	HQ = 1 and ELCR < $1x10^{-4}$
Dioxin TEQ-HH	5.15E-02	1E-03	27	3.6E-05	3.6E-04	3.6E-03	1.9E-04	1.9E-03	5.8E-03	1.9E-03	HQ = 1 and ELCR < $1x10^{-4}$
Trespassing Teenager - Site O North											
PCBs, Total	709	3E-05	5	21	206	2060	13	129	388	15	HQ <1 and ELCR < $1x10^{-4}$
Dioxin TEQ-HH	5.15E-02	1E-04	4	5.2E-04	5.2E-03	5.2E-02	1.2E-03	1.2E-02	3.7E-02	1.9E-03	HQ < 1 and ELCR < $1x10^{-4}$
Outdoor Industrial Workers - Site Q Central											
Dioxin TEQ-HH	2.09E-03	6E-05	1	3.6E-05	3.6E-04	3.6E-03	1.9E-04	1.9E-03	5.8E-03	1.9E-03	HQ = 1 and ELCR < $1x10^{-4}$
Outdoor Industrial Workers - Site Q South											
Dioxin TEQ-HH	3.70E-03	1E-04	2	3.6E-05	3.6E-04	3.6E-03	1.9E-04	1.9E-03	5.8E-03	1.9E-03	HQ = 1 and ELCR < $1x10^{-4}$
Cadmium	3650	NC	3	NA	NA	NA	106	1064	3192	1064	HQ = 1
Outdoor Industrial Workers - Site S											
PCBs, Total	1009	9E-04	66	1	11	107	2	15	46	15	HQ = 1 and ELCR < $1x10^{-4}$
Trespassing Teenager - Site S											
PCBs, Total	1009	5E-05	8	21	206	2060	13	129	388	15	HQ <1 and ELCR < $1x10^{-4}$

ELCR = excess lifetime cancer risk

NA = Not applicable

NC =Non-carcinogen

APPENDIX F

TSCA 40 CFR SECTION 761.61(C) DETERMINATION MEMO

TSCA 40 CFR Section 761.61(c) Determination

The Sauget Area 2 Site, located in Villages of Sauget and Cahokia, Illinois, consists of five inactive disposal areas (Sites O, P, Q, R, and S). Of these disposal sites, three are closed landfills (Sites P, Q, and R), one consists of four closed sludge lagoons (Site O), and one is a waste disposal site (Site S) associated with an abandoned solvent reclamation facility.

In 1993 Site Q was flooded and River currents unearthed a number of barrels containing hazardous waste. EPA conducted a Removal Action along the shore of the Mississippi River at Site Q Central; removing polychlorinated biphenyls (PCB) contaminated soils and drums exposed by erosion during the flood. On October 18, 1999, EPA initiated a second Removal Action at Site Q South. EPA excavated Site waste from eight different areas on 25-acres of Site Q South. Approximately 17,032 tons of waste, comprised of about 20 percent low-level waste (soil concentrations less than 50 parts per million (ppm) of PCBs) and 80 percent high-level waste (soil concentrations greater than 50 ppm of PCBs) were shipped off-Site for disposal. In addition, 3,271 drums of PCB wastes were removed and disposed off-Site. This second removal action was completed on April 5, 2000.

The remaining PCB containing areas at the Sauget Area 2 Site are the disposal areas at Sites O, P, Q, R, and S. These disposal areas contain municipal and industrial waste materials, including crushed or partially crushed drums, drum fragments, debris, and miscellaneous trash. Collectively, Sites O, P, Q, R, and S contain an estimated 4.5 million cubic yards of soil and waste. The lower portion of the waste at these Sites is below the water table. Remedial investigation sampling at Sites O, Q North, R, and S revealed PCB levels in the soil above 50 ppm. Soil samples taken from subsurface soil and waste showed PCB concentrations ranging from zero to 990 ppm at Site O; zero to 90 ppm at Q North, zero to 2 ppm at Site Q Central, zero to 10 ppm at Site Q South, zero to 130 ppm at Site R, and zero to 20 ppm at Site S.

Groundwater sampling results showed PCB concentrations ranging from non-detect to 0.2 ppm in the shallow hydraulic unit, non-detect to 8.0×10^{-4} ppm in the middle hydraulic unit, and non-detect to 1.2×10^{-3} ppm in the deep hydraulic unit. The Safe Drinking Water Act Maximum Contaminant Level for PCBs is .5 ppb or 5.0×10^{-4} ppm. Overall, because PCBs are relatively insoluable in water, concentrations of PCBs in groundwater occur sporadically and at comparatively low concentrations both upgradient and downgradient of the disposal areas, throughout the aquifer. Therefore, groundwater is not significantly impacted by PCBs and PCBs contaminated wastes are contained within the disposal areas.

The PCB-contaminated soils and wastes in the disposal areas in Sauget Area 2 Sites O, Q North, R, and S meet the definition of a PCB remediation waste as defined under 40 CFR § 761.3 because the soils and wastes contain PCBs as a result of a spill, release or unauthorized disposal which occurred prior to April 18, 1978. These PCB remediations are regulated for cleanup and disposal under 40 CFR Part 761. Under 40 CFR § 761.61(c), PCB remediation waste may be disposed of in a manner other than prescribed under Section 761.61(a) or (b), provided EPA determines that the method of disposal does not result in an unreasonable risk of

injury to health or the environment. In accordance with the requirements under TSCA and 40 CFR § 761.61(c), I have reviewed the Administrative Record for the Sauget Area 2 Site (Site) and considered the Selected Remedy for OU1 at the Sauget Area 2 Site.

The Selected Remedy for OU1 consists of: Site consists of:

- Site O and O North: Alternative O2- 35 IAC §724 Compliant Soil Cap Over Identified Waste Areas and Institutional and Access Controls;
- Site P: Alternative P3- Non-aqueous phase liquid (NAPL) Collection at Well (LEACH P-1), Asphalt Cap over Potentially Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Site Q North: Alternative QN2- 35 IAC §724 Compliant Crushed Rock Cap Over Dogleg Area, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Site Q Central: Alternative QC3- In-situ Soil Vapor Extraction (SVE) at Mobile Source Area (AT-Q32), 35 IAC §724 Compliant Crushed Rock Cap Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls;
- Site Q South: Alternative QS3- Removal of Intact Drums at AT-Q35, 35 IAC §724 Compliant Cap Over Identified Waste Areas, and Institutional and Access Controls;
- Site R: Alternative R2- 35 IAC §724 Compliant Soil Cap Over Entire Site and Institutional and Access Controls; and
- Site S: Alternative S3- In-Situ SVE of Mobile Source Area, 35 IAC §724 Compliant Soil Cap Over Entire Site and Institutional and Access Controls.

This Selected Remedy for OU1 at the Sauget Area 2 Site addresses principal threat wastes[1] that are present at the Site. Previous removal actions conducted by EPA at Site Q Central and Site Q South already have removed principal threat wastes by excavating and disposing off-Site approximately 14,000 tons of high-level polychlorinated biphenyls (PCB) contaminated soil and 3,271 drums. EPA also ordered the construction of a Groundwater Migration and Control System (GMCS) next to the Mississippi River as an early interim OU2 groundwater remedy to capture and treat area groundwater before it releases to the River.[2]

[1] Principal threat waste is a source material that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur.

[2] In September 2002, EPA issued a CERLCA Section 106 unilateral administrative order (UAO) requiring potentially responsible parties (PRPs) to install the Sauget Area 2 GMCS as an interim OU2 groundwater remedy for the Sauget Area 2 Site. This system is comprised of a 3,300 ft long "U"-shaped, fully penetrating barrier wall located downgradient of Sauget Area 2, Site R, and Sauget Area 1. The barrier wall extends from approximately 3 feet below ground surface to the top of bedrock and includes three groundwater extraction wells on the upgradient

Additional principal threat PCB wastes have been observed at Site P, Q North, Q South, and R. The Selected Remedy addresses the areas on Sites P and Q South by treating the recovered NAPL, which includes PCBs, from Site P through off-Site incineration; and removal and off-Site treatment and disposal of intact drums of PCB waste located on Site Q South. The NAPL, which includes PCBs, identified on Site Q North and Site R are captured and treated by the Sauget Area 2 GMCS. The Selected Remedy for OU1 will treat the remaining principal threat wastes identified at the Site through off-Site incineration of the recovered NAPL from Site P and removal of intact drums from Site Q South.

To address the remaining low-level threat waste, which presents a direct contact exposure risk from soils and waste contaminated with PCBs, engineering controls[3] in the form of engineered covers will be implemented. Engineered covers meeting the requirements of 35 IAC § 724 compliant caps will be installed over Sites O, O North, Q North, Q Central, Q South, R, and S; and 35 IAC § 807 caps will be installed over Site P.

The Selected Remedy is expected to achieve substantial and long-term risk reduction of PCBs through treatment. It is expected to prevent future exposure to currently contaminated soils and groundwater. It is expected to allow the property to be used for the reasonably anticipated future land use, which is industrial. Based on the information provided, the containment and treatment remedies for the Sauget Area 2 Sites O, P, Q, R, and S will ensure that the PCBs at Sauget Area 2 will not pose an unreasonable risk of injury to health or the environment.

Richard C. Karl, Director
Superfund Division
EPA Region 5

12-17-13
Date

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side of the barrier wall. The GMCS intercepts and captures an estimated 210 million gallons of contaminated groundwater a year, which is pumped to the American Bottoms Regional Water Treatment Facility (ABRTF) in Sauget. The groundwater is treated at the ABRTF and ultimately discharged to the Mississippi River in compliance with the terms and conditions of the ABRTF's National Discharge Pollutant Discharge Elimination System (NPDES) permit issued under the Clean Water Act.

[3] Engineering controls encompass a variety of engineered and constructed physical barriers (e.g., soil capping, sub-surface venting systems, mitigation barriers, fences) to contain and/or prevent exposure to contamination on a property.

APPENDIX G

STATE CONCURRENCE LETTER

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-2829

PAT QUINN, GOVERNOR LISA BONNETT, DIRECTOR

217.785.7728

December 16, 2013

U.S. Environmental Protection Agency
Ms. Stephanie Linebaugh
Superfund Division, Mail Code: SRF-6J
77 West Jackson Boulevard
Chicago, Illinois 60604-3507

Re: Record of Decision for
Operable Unit 1, Sauget Area 2

1631215032 – St. Clair Co.
Sauget/Sauget Area 2
Superfund/Technical Reports

Dear Ms. Linebaugh,

The Illinois Environmental Protection Agency (Illinois EPA) is pleased to provide its concurrence with the Sauget Area 2, Operable Unit (OU) 1, Record of Decision (ROD). The Sauget Area 2 ROD selects Alternatives O2, P3, QN2, QC3, QS3, R2 and S3 from the Final Feasibility Study to address soils, sediment, surface water and groundwater source contamination at the Sauget Area 2 Sites. A second ROD to address area-wide groundwater contamination is anticipated. Please append Illinois EPA's Declaration to the final version of the ROD.

Should you have any question or require further assistance concerning this letter, do not hesitate to contact me at the number above or by e-mail at *Paul.Lake@illinois.gov*.

Sincerely,

Paul T. Lake, Remedial Project Manager
Federal Facilities Unit
Bureau of Land

PTL:rac:p:/site files/FSRS/NPLU/Sauget/Area 2 Sites/IEPA SA2 OU1 ROD Declaration Cover Ltr_121613.docx

Enclosure: Illinois EPA Declaration for the Sauget Area 2 ROD

cc: Renee Snow, IAGO
Todd Rettig, IDNR
Annette Trowbridge, USFWS
Tom Martin, USEPA

DECLARATION FOR THE RECORD OF DECISION

Selected Remedy for the
Sauget Area 2 Proposed NPL Site – Operable Unit 1
Sauget and Cahokia, St. Clair County, Illinois

SITE NAME AND LOCATION

1631215032 – St. Clair County
Sauget Area 2 Proposed NPL Site – Operable Unit 1
CERCLIS Identification Number: ILD 000 605 790
Villages of Sauget and Cahokia, St. Clair County, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for the Operable Unit 1 of the Sauget Area 2 Site. The United States Environmental Protection Agency (USEPA), in consultation with the Illinois Environmental Protection Agency (Illinois EPA), is choosing these remedies in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA or Superfund) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations (CFR) 300-399). All decisions have been made based upon the Administrative Record for the Sauget Area 2 Site. This declaration indicates the State of Illinois' concurrence with the selection of Alternatives O2, P3, QN2, QC3, QS3, R2 and S3 from the Final Feasibility Study for Sauget Area 2.

ASSESSMENT OF THE SITE

The response actions selected in the Record of Decision (ROD) are necessary to protect the public health or welfare and the environment from the actual or threatened release of hazardous substances, pollutants or contaminants into the environment.

SIGNIFICANT CERCLA ACTIONS IN SAUGET AREA 2

USEPA, Illinois EPA and potentially responsible parties (PRPs) have implemented extensive clean-up activities in Sauget Area 2 already. These actions have addressed some of the more mobile and toxic contaminant source materials formerly present at the site. Removal actions conducted by USEPA at Site Q Central and Site Q South addressed principal threat wastes by excavating and disposing off-site approximately 3,271 drums and 14,000 tons of high-level polychlorinated biphenyl (PCB) contaminated soil. In 2002 USEPA also ordered the construction of a groundwater barrier wall and the installation of extraction wells, together called the Groundwater Migration and Control System (GMCS), next to the Mississippi River as an early interim groundwater (OU2) remedy.

The GMCS captures and treats area groundwater before it otherwise would be released to the River. The system is comprised of a 3,300 foot long "U" shaped, fully penetrating barrier wall

located downgradient of Site R, the former Clayton Chemical facility, Solutia's Krummrich plant and sites identified as part of Sauget Area 1. The barrier wall was installed beginning at a depth of about three feet below ground surface and is keyed into bedrock approximately 130 feet below ground surface. Three groundwater extraction wells located on the upgradient side of the wall intercept and capture an estimated 210 million gallons of contaminated groundwater a year. The contaminated water is pumped to the American Bottoms Regional Water Treatment Facility (ABRTF) in Sauget for treatment and ultimately is discharged to the Mississippi River in compliance with the ABRTF's National Discharge Pollutant Discharge Elimination System (NPDES) permit.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy will address contaminant source materials remaining at the site and will be the first of two remedial decisions and remedial actions for the Sauget Area 2 Site. The overall strategy for cleaning up the site is to first address soil, sediment, surface water, and groundwater source contamination through this remedial action for OU1. Area-wide groundwater contamination resulting from the contaminated soil and groundwater source areas in the Sauget Area 1 and Sauget Area 2 Sites will be addressed as a separate remedial action (OU2). The regional groundwater remedy will be selected in a separate groundwater ROD for both the Sauget Area 1 and Sauget Area 2 Superfund Sites.

The remedial action proposed in this ROD will be the final remedy for contaminated soils, sediments, surface water and groundwater at the Sauget Area 2 Site. Sauget Area 2 consists of five inactive disposal areas (Sites O, P, Q, R and S). Three of the disposal areas are closed landfills (Sites P, Q and R), one consists of four closed sludge lagoons (Site O) and one disposal area is an abandoned solvent reclamation facility (Site S). Collectively, the Sauget Area 2 disposal areas contain an estimated 4.5 million cubic yards of waste. U.S. EPA's selected remedy for OU1 at the Sauget Area 2 Site consists of the following alternatives:

- Site O and O North, Alternative O2: 35 IAC § 724 Compliant[1] Soil Cap Over Identified Waste Areas and Institutional and Access Controls;
- Site P, Alternative P3: Collection, Treatment, and Off-Site Disposal of Non-Aqueous Phase Liquid (NAPL) at Well (LEACH P-1), Asphalt Cap over Potentially Mobile Source Area (SA-P-3/AT-P-5), 35 IAC § 807 Solid Waste Landfill Cap Over Remainder of Identified Waste Areas, Vapor Intrusion Mitigation , and Institutional and Access Controls;
- Site Q North, Alternative QN2: 35 IAC § 724 Compliant Crushed Rock Cap Over Dogleg Area, Vapor Intrusion Mitigation, and Institutional and Access Controls;
- Site Q Central, Alternative QC3: In-Situ Soil Vapor Extraction (SVE) at Mobile Source Area (AT-Q32), 35 IAC § 724 Compliant Crushed Rock Cap Over Identified Waste Areas, Shoreline Erosion Protection, and Institutional and Access Controls;

[1] A 35 IAC § 724 compliant soil or crushed rock cap meets the performance standards of RCRA Subtitle C cap, except the component requiring long-term minimization of the migration of liquids. This component is not appropriate for the Sauget Area 2 Sites due to site-specific conditions including wastes materials located below the water table and the presence of the GMCS.

- Site Q South and Q South Ponds, Alternative QS3: Removal of Intact Drums at AT-Q35, 35 IAC § 724 Compliant Cap Over Identified Waste Areas, and Institutional and Access Controls;
- Site R, Alternative R2: 35 IAC § 724 Compliant Soil Cap Over Entire Site and Institutional and Access Controls; and,
- Site S, Alternative S3: In-Situ SVE at Mobile Source Area, 35 IAC § 724 Compliant Soil Cap Over Entire Site, and Institutional and Access Controls.

The selected alternatives for OU1 of Sauget Area 2 address additional principal threat wastes that are present at Sites P, Q South, Q North and R. Alternative P3 will collect NAPL identified in groundwater at Site P and treat it through off-site incineration. Alternative QS3 will remove, treat and dispose of intact drums located in Site Q South. The principal threat waste materials and NAPL identified at Sites Q North and R will continue to be captured by the GMCS and treated by the ABRTF.

To address the remaining low-level threat waste, engineered soil or crushed rock covers designed and managed to meet the relevant and appropriate State of Illinois hazardous waste landfill closure and post-closure requirements (35 IAC § 724.410) will be installed over Sites O, O North, Q North, Q Central, R, and S. A two-foot thick soil cap designed and managed to meet the applicable State of Illinois non-hazardous waste landfill closure and post-closure requirements (35 IAC § 807 Subparts C and E) will be installed over the previously permitted Site P. SVE will be used to collect and treat contaminants at Site Q Central and Site S. The need to address potential risks associated with vapor intrusion in re-developed areas of Sites P and Q North will be further evaluated, and, mitigated as necessary.

Active treatment and engineering controls will be augmented by the use of Institutional Controls (ICs) appropriate for the Sauget Area 2 Site and are a common element of each selected alternative. ICs are designed to control access to the site, manage construction or other intrusive activities that may disturb soil or waste, minimize potential exposure to contaminants of concern, and ensure that groundwater is not used for drinking water purposes.

At a minimum, ICs will be implemented in accordance with the Illinois Uniform Environmental Covenant Act to restrict residential development of the Sauget Area 2. Consistent with expectations set out in the Superfund regulations, the preferred alternatives do not rely exclusively on ICs to achieve protectiveness. A detailed description of the ICs for Sauget Area 2 will be developed in an Institutional Controls Implementation Plan to be prepared during the remedial design process.

As presented in the ROD Decision Summary, USEPA verified that all information necessary to comply with their ROD Data Certification Checklist is present in the document.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and, utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

This remedy satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). The Selected Remedy calls for the treatment of NAPL through off-site incineration of the collected NAPL from Site P, the removal and off-site treatment and disposal of intact drums from Site Q South, and, the treatment of contaminants in-situ with SVE at Site Q Central and Site S. Additionally, NAPL identified at Site Q North and Site R will continue to be captured by the GMCS and treated by the ABRTF. The selected remedy provides a significant degree of treatment. Through modeled mass flux calculations it is estimated that the continued operation of the GMCS will treat between 15,000 kilograms (year 2020) and 10,000 kilograms (year 2038) of mobile contaminants per year. The SVE system installed at Site S is anticipated to recover and treat between 62,000 and 99,000 pounds of volatile organic contaminants.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

STATE CONCURRENCE

The State of Illinois concurs with the selection of Alternatives O2, P3, QN2, QC3, QS3, R2 and S3 from the Final Feasibility Study for Sauget Area 2. When USEPA receives the State's letter of concurrence, it will be attached to the ROD.

AUTHORIZING SIGNATURE

Lisa Bonnett, Director
Illinois Environnemental Protection Agency

12/16/13
Date